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Feather Mites of the *Aralichus canestrinii* (Trouessart) Complex (Acarina, Pterolichidae) from New World Parrots (Psittacidae) I. From the Genera *Ara* Lacépède and *Anodorhynchus* Spix

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Abstract

One named and 11 new feather mite species of the genus *Aralichus* Gaud (Pterolichoidea, Pterolichidae) are (re)described from New World parrots: **A. canestrinii** (Trouessart) from *Ara macao*, **A. ambiguae** from *Ara ambigua*, **A. araraunae** from *Ara ararauna*, **A. chloropterae** from *Ara chloroptera*, **A. couloni** from *Ara couloni*, **A. maracanae** from *Ara maracana*, **A. manilatae** from *Ara manilata*, **A. mexicanus** and **A. militaris** from *Ara militaris*, **A. nobilis** from *Ara nobilis*, **A. severae** from *Ara severa castaneifrons*, and **A. anodorhynchi** from *Anodorhynchus hyacinthinus*. The ontogenetic series for *A. canestrinii* is discussed, as are general morphological characters of *Aralichus* (*s.l.*).

Introduction

During the late 1800s and early 1900s, E. L. Trouessart, often in collaboration with P. Mégnin or J. Favette, described many taxa of feather mites from the world avifauna, including 51 species of pterolichids from parrots. Of these, 14 New World and 22 Old World species were assigned (either originally or subsequently, e.g., Dubinin, 1956) to *Protolichus* (*s.l.*) Trouessart.

Recently, new higher level taxa have been established or redefined that include 16 of the 36 Trouessart et al. species: *Aralichus* Gaud and *Echinofemur* Atyeo and Pérez for New World mites; and *Aterolichus* Gaud, *Atopolichus* Gaud, *Mesolichus* Trouessart, and *Uropsittacolichus* Atyeo and Pérez for Old World mites. *Distigmesikya* Atyeo et al. and *Avenzoariurus* Atyeo, taxa related to the aforementioned genera, were established for new species taken from New World parrots.

In a series of papers, I plan to revise the New World genus *Aralichus* in which I (conservatively) estimate there are 50 species. These species represent at least six distinct morphotypes, and each morphotype represents a species complex. The complexes and their associated host genera have been listed, but the complexes have not been defined (Pérez & Atyeo, 1986; Faccini & Atyeo, 1986). The first revision will be the *Aralichus canestrinii* (Trouessart) complex; this first part includes one named and 11 new species from the avian genera *Ara* Lacépède and *Anodorhynchus* Spix. In addition, the ontogenetic series of this species complex will be discussed for the first time.

Methods

Study Collection

I have approximately 1,125 collections taken by examining 2,575 museum study skins of New World parrots plus samples taken from field-collected parrots in Mexico. Each collection contains all mites taken from a single study skin. In some instances a collection contains no more than 20 mites; in other collections there may be hundreds or even thousands of specimens representing numerous feather mite taxa.

The collections represent at least one sample from all extant New World parrots except one species of *Anodorhynchus,* one of *Ara,* one of *Pyrrhura* Bonaparte, two of *Touit* Gray, and one species of *Amazona* Lesson. In addition, we have examined many skins of extinct species and have obtained excellent collections from the Carolina parakeet.

Illustration Preparation

The species in the *Aralichus canestrinii* complex are similar. Differences are best observed in the opisthosomata and tarsi IV of males, and the hysterosomal ornamentation of immatures. To illustrate these differences, line drawings of male termini and tarsi IV are presented. For females, SEM micrographs illustrate ornamentation, which is in the form of pits on the hysterosomal shield and polygons on the prodorsal shield (fig. 33). For immatures, of which I had few specimens, SEM micrographs are employed to show types of ornamentation and terminal spines (e.g., figs. 41–48).

In males and most females, pits cover the hysterosomal shield (figs. 25, 29, 33); in the line drawings, these are represented by small circles (e.g., fig. 2). Drawings were prepared with a Wild-Heerbrugg M-20 phase contrast microscope with drawing tube.

Preparation of Specimens for Scanning Electron Microscopy

Feather mites tend to remain on the host after death. When bird skins are prepared in the field, they are usually wrapped, thereby trapping the mites and killing them by desiccation. A portion of the mite fauna on a museum study skin can be recovered, especially from the wing and tail feathers and some of the larger coverts. This is accomplished by briskly agitating these feathers and collecting everything that is dislodged. Mites and debris are placed in 70% ETOH; later, the mites are removed, cleaned in an ultrasonic cleaner, and mounted on SEM stubs.

A Philips 505 scanning electron microscope was used for these studies. For good scanning electron micrographs, properly fixed materials are needed. However, in this study, the parrot hosts are endangered species and/or not available to us alive so that the ectoparasites could be removed and fixed. Consequently, I used specimens from museum study skins. The skins and the mites taken from them are often over 100 years old but this is of no consequence, as age does not destroy the external skeletons of these small arthropods.

There are disadvantages to this collecting technique. First, and most important, I seldom recover mites that inhabit the smaller feathers of the body and wings, therefore samples are biased. Second, the specimens are usually distorted because of desiccation; often, setae may be broken or missing. The micrographs evidence this poor specimen condition, but at the same time demonstrate important character-states.

Systematic Formats

KEY FORMAT—Characters for the key to males are those easiest to discern, namely, shapes of major setae, distances between major setae, dimensions of certain setae, and the overall lengths and widths. The different character-states are illustrated. A key to females has not been prepared, as species differences among this sex are primarily measurements, and these are not amenable to keys.

SPECIES FORMAT—The (re)descriptions of the one named and 11 new species are based on available series. Because the taxa are very similar, descriptions, by necessity, include numerous measurements (see Measurements below). In the type data sections, the sequence of information is as follows: the host species, the locality given in descending order, the numbers and life stages of the specimens examined, the date the bird specimen was collected, the collector, and (in parentheses) the accession number for the bird skin followed by the accession number of the mite collection.

If there are materials other than the types, information is abbreviated—host name, country from which the bird was originally collected, and numbers of specimens examined. Full collecting data is not deemed necessary, as the hosts may occur in large geographical areas and, unless otherwise shown, it is assumed that the host species will have the same acarofauna throughout its range.

PROPOSED NAMES—The etymology will not be given in each description, as proposed names derived from the host names are obvious.

Abbreviations

Each collection from an individual bird carries two accession numbers. One is the number of the bird skin from which a collection is taken, the other is the accession number for the mite collection. Both numbers are carried on the data label. The abbreviations for accession numbers are:

Akademii nauk SSSR, Leningrad (LAS)
American Museum of Natural History, New York (AMNH)
British Museum (Natural History), London (BMNH)
Field Museum of Natural History, Chicago (FMNH)
Trouessart Collection, Paris (TRT)
Universidad Nacional Autónoma de México, México, D.F. (UNAM)
University of Georgia, Athens (UGA)
National Museum of Natural History, Washington, D.C. (NMNH)
Youngstown State University, Youngstown, Ohio (YSU)
Collection of J. Gaud, Nice, France (GAUD)
Specimens field-collected by the author (TMP)

Measurements

Signatures for idiosomal chaetotaxy follow Atyeo and Gaud (1966); signatures for the chaetotaxy and solenidiotaxy of the legs follow Grandjean's system as applied by Griffiths (1964) for *Acarus siro* (L.). Measurements are in micrometers. Morphometric data from the idiosomata are given as mean ± standard error, observed limits (OL), and the number of specimens (N); if the number of specimens is less than 10, only the mean and observed limits will be given (except table 2). Lengths of leg segments are given as observed limits, as variation is usually small; if one or more specimens have extremely large segments, these will be noted after the appropriate measurement in parentheses.

The approximately 10,000 measurements of slide-mounted specimens reflected intraspecific variation *and* specimen distortion. Structures subject to the least distortion, that is leg segments and setae inserted on sclerotized shields, were deemed as excellent candidates for morphometric studies. However, legs tend to be angled dorsoventrally, and setal positions in the *canestrinii* complex are quite variable. Measurements and problems encountered are discussed below.

1. Total length, male: from palpal apices to ends of membranous lobes subtending setae *d5*.

2. Total length, female: from palpal apices to bases of setae *d5*.

3. Idiosomal width: distance between humeral setae; that is, immediately anterior to trochanters III.

These mites are dorsally convex. In slide preparation, if too much pressure is exerted on the coverslip, the mites are flattened and the (apparent) widths are increased; similarly, the (apparent) lengths can be increased by stretching the flexible sejugal region. There is a dilemma because, for proper leg orientation, specimens must be rather flat. The best estimates of lengths and widths are probably from the lower observed limits to the means.

4. Gnathosoma: width at the widest point, length from palpal apices to base at meson.

There are two types of distortions. First, the basis capitulum is fused with the heavily sclerotized anterior epimerites; as the gnathosomal base is crushed, it is difficult to differentiate the sclerotizations of the gnathosoma and coxae. Second, the palpi in repose are angled from their bases toward the meson; with distortion, the palpi tend to be parallel to the meson, that is, the measurement of length is increased. To compensate for this type of distortion, the normal position is estimated and a measurement taken.

5. Distances between idiosomal setae: distances between members of the same pair are measured center-to-center; distances between rows of setae are measured as the vertical distance (i.e., parallel to the meson) between the rows.

6. Distances between setae of the male terminal lobes: distances *d5*:*d5* and *l5*:*l5* indicate the width of the terminal cleft; depending on the species, the lobes may be quite widely separated due to preparation, but by examining a series, the normal configuration can be visualized.

The vertical distance between setae *d3* and *pai* is measured to the anterior margin of the *pai* alveolus; *pai*:*d5* is measured from the posterior margins of the two alveoli, as is the distance *d5*:*l5*.

7. Male terminal cleft height: the vertical distance between the lobe apices and the most anterior part of the cleft. In some species, the ventral tegument tends to fold rearward, thus changing the cleft configuration. Usually when this occurs, the apex of the cleft will not be a smooth arch, but rather a straight line or a rounded projection into the cleft.

8. Setal lengths: from base to tip; however, longer setae may vary considerably for these measurements. Longer setae become finer and finer

toward their tips; whether the tips are broken is almost impossible to ascertain. Setae that are coarsely serrate are irregular in shape; longer terminal serrations may be broken or not formed. Thus, lengths of female setae *l4* and *pai* may not be consistent within a species due to these factors.

9. Male setae *pai*: length is the greatest vertical distance (parallel to the meson) from the most anterior portion to the termination. If these setae are large, they may not be fully extended and an erroneous measurement can be taken.

10. Leg segment lengths: lengths of the femora, genua, and tibiae of the legs are measured from (dorsal) articulation to (dorsal) articulation parallel to the long axis of the segment. Tarsal lengths are to the tarsal apex.

It is not common to have all leg segments in the same focal plane. When this does occur, the legs are usually oriented so that a lateral aspect is presented. Even in the most ideal position, there are difficulties in delimiting each segment, as one is in essence measuring the sclerotized wall of the segment and an articulation may include the dorsal surface of one segment overlapping the base of the next segment. Lastly, the tips of the tarsi are flexible, creating errors in the measurements.

Much of the "intraspecific" variation for leg segments is probably due to measuring error. In blind tests and in remeasuring the same individuals, a difference of one measuring reticule scale unit (= 1.96 μm) was not uncommon. Consequently, only the observed limits for leg segments are given; as can be seen, differences between observed limits are small.

Classification

Family **Pterolichidae** Trouessart and Mégnin

Subfamily **Pterolichinae** Trouessart and Mégnin

The Pterolichinae is a large, diverse group of feather mites associated with many groups of nonpasseriform birds. Each of the 41 named and 20 unnamed genera is associated with one family of birds; however, a family of birds can have associates of more than one genus. A case in point would be parrots, a worldwide group supporting all species of 11 genera of pterolichines. Furthermore, all members of each parrot-associated genus or species group within a genus are restricted to the New World, Africa, or Indo-Australia. Neither the subfamily Pterolichinae nor the genus *Aralichus* has been revised; therefore, keys and detailed diagnoses have never been produced. In this and following papers, species groups of *Aralichus* will be diagnosed and, in the final paper of the series, keys and a diagnosis of the genus *Aralichus* will be given.

Genus **Aralichus** Gaud

Aralichus Gaud, 1966: 121.
Type species: *Pterolichus* (*P.*) *canestrinii* from *Ara macao* (L.) (by original designation).

Major References—Gaud (1966), Pérez and Atyeo (1984a, 1986).

Diagnosis of the *Canestrinii* Complex—Gnathosoma triangular with width greater than length, basis capitulum with strong internal sclerotizations posterolaterally. Prodorsal shield divided, with or without reticular ornamentation, internal vertical setae not extending to apices of palpi, external scapular setae short and fine, internal scapulars shorter and usually with greater diameters than external pair, strong internal sclerotizations between coxae I and II and posterior to coxae II. Dorsal hysterosoma with undivided shield, with variously sized pits or glabrous, setae *l1* short and simple, setae *d4* absent. Venter with epimerites I free or connected by weak commissure. Legs subequal, legs III and IV positioned sublaterally; femora, genua, and tibiae of legs I and II with weakly developed apicoventral spines.

Male—Widely separated terminal lobes without terminal membranes, setae *pai* triangular or truncated with two dorsal vanes (illustrated as veins), setae *d3* near lobe bases, setae *d5* setiform to basally expanded, setae *l5* and *pai* at approximately the same level, setae *l3* simple or with small basal branch, adanal discs with sclerotized and multidentate corollae, posterolateral internal sclerotizations to level of anterior margins of adanal discs, tarsus IV with setae *d* and *e* as small pegs.

Female—Hysterosomal shield entire, setae *l4* and *pai* as short serrated leaves or setiform, setae *d5* about one-half to two-thirds length of *l5*, pregenital apodeme short, sperm pore on small terminal projection.

General Morphology—A few generalizations about the morphology of *Aralichus* (*s.l.*) and the related genera *Distigmesikya* and *Echinofemur*. In adults, the external scapular setae are reduced in length and diameter; the resultant structures are short, fine setae. The internal scapulars are more varied: at one extreme they are small, fine microsetae; at the other end of a continuum, these setae can be long, thick, and sometimes branched (e.g., *Distigmesikya*). The internal vertical setae are of moderate length in *A. canestrinii*; however, in related taxa they can be expanded as elongate leaves and can extend well beyond the palpal apices (e.g., *Echinofemur*).

Larvae and nymphs have progressively larger setae *l1* and *h*. Each *l1* curves dorsad following the curvature of the idiosoma; a small basal branching may be present or absent. The humeral setae are usually directed laterad; in some taxa they gradually curve dorsad so that the tips of the setae are above the level of the idiosomal dorsum.

In males, setae near the posterior idiosomata have many configurations. Setae *l3* are erect and may be simple or have a short basal branch. Setae *l4* usually resemble a feather on an arrow, that is, from the seta proper, there is a unilateral leaflike expansion; the "feather vane" is directed dorsolateral (fig. 26). In microscopic preparations setae *l4* may appear as simple thickened setae or as narrow leaflike setae (e.g., fig. 2). Setae *l5* are long and simple or rarely long and leaflike. Setae *d5* are simple, or with basal leaflike expansions of various shapes (figs. 20, 23–24). Finally, setae *pai* have many leaflike shapes; they have in common one or two thin dorsal crests which appear as veins under light microscopy (compare fig. 2 with figs. 25–26, 29–30).

In females, the terminal setae are of two forms, simple or as small, serrated leaves. Setae *l5* and *d5* are simple; *l5* is long, *d5* may be long or short. Both *l4* and *pai* are short and may be setiform or expanded distally into small leaves which have various types of points or serrations (figs. 4, 33). In slide preparations these setae have a tendency to roll up lengthwise in such a fashion as to appear as a thickened setae with small terminal branchings.

The last generalization concerns the pretarsi. Ambulacra II–IV in *Aralichus* and related taxa and pretarsi I–IV in *Protolichus* have small teeth on the outer (distal) margins. Ambulacra I of the *Aralichus* complex are apically asymmetrical with three to four small, fingerlike projections of decreasing sizes on the distal margins.

Ontogenetic Series—The dorsal and lateral idiosomata are more heavily sclerotized than the venters. The prodorsal shields of immatures are developed anterior to the scapular setae; their posterior margins may have large, shallow pits that appear as irregular polygons with light microscopy (fig. 48); these pits are most developed in the later instars. In some larvae there may be small, weakly developed pits; in others, pits are apparently absent.

In immatures, the dorsal tegument posterior to the scapular setae has wide parallel elevations or ridges separated by thinner, irregular channels or "striae" (e.g., figs. 41–48). In *Aralichus nobilis*, n. sp., the "striae" are not irregular, but straight lines. In some species, e.g., *A. canestrinii*, the tegumental ridges may be weakly developed or absent in the area delineated by setae *d3–4* (figs. 38–39); in other species, e.g., *A. araraunae*, n. sp., the ridges in this region are well developed (figs. 41–43).

If present, the most spectacular modification of the idiosoma are rows of spines along the posterolateral margins, spines whose origins are the elevated tegumental ridges separated by striae. There are a number of observable conditions: the ridges may form well-developed spines (figs. 35–36), small spines (figs. 42, 46), appear as blunt tubercles (fig. 47), or be absent. The venter has a normal striation pattern (fig. 36).

The developmental chaetotaxy of the idiosoma is the same as described for *Proctophyllodes pari* (Atyeo & Braasch, 1966) except that setae *d4* are always absent. Within the *A. canestrinii* complex and related taxa, the immatures have well-developed external scapular setae as found in most other Pterolichidae adults. The positioning of these setae in the various instars divides the *canestrinii* complex into two groups. In the majority of the species, the scapular setae are posterolateral to the prodorsal shield in all life stages. In *canestrinii* and the new species *chloropterae, ambiguae,* and *mexicanus,* these setae are equidistant in the larvae (figs. 7, 41); but in each nymphal instar the external scapulars shift more toward a position between legs I and II, culminating in the tritonymph, in which the external scapulars are far lateral of the prodorsal shield (figs. 5, 35).

Most dorsal hysterosomal setae are positioned as in Figures 5–7. The levels of *d3* relative to *l3* vary between and among the species. Setae *d3* may be about midway between the opisthonotal gland and *l3* to closer to *l5* than to *l3*, i.e., dorsoterminal. Within each species, there are two positions for setae *d3*, one more anterior than the other; this may be an expression of sexual dimorphism. In the few pharate males (I have no pharate females), *d3* is always in the more anterior of the two possible positions. Nymphs have setae *l4* and

TABLE 1. Gnathosomal measurements (in μm) of *Aralichus canestrinii* from larva to adult.

Stage	A	B	C
Larva	59	48	41
Protonymph	84	67	49
Tritonymph	110	82	61
Adult			
Male	137	100	65
Female	141	102	73

A = Width basis capitulum, B = total length, C = width at palpal bases.

pai as small serrated leaves or as simple setae. Setae *l5* are long and setae *d5* may be short (about 25 μm) or one-third to three-quarters the length of *l5*.

In some of the *canestrinii* group the larvae and nymphs have a distinct pygidial region which under light microscopy is heavily sclerotized (compare figs. 5–7 with 38–40). There is no correlation between the presence or absence of this region and the placement of the external scapular setae.

The gnathosomata of larvae are almost quadrate, those in adults triangular. From the larva to the adult, there is a proportionately greater increase in width than in length. To illustrate, using *Aralichus canestrinii* as an example, three measurements will be used: the width of the basis capitulum at the widest point, the width at the bases of the palpi (to illustrate progressive change in the basis capitulum from almost rectangular in the larva to triangular in the adult), and the length of the gnathosoma from the base to the palp apices (Table 1).

Legs and I and II have apicoventral apophyses on the femora, genua, and tibiae. These are weakly developed in the larvae; with each instar, these structures are more pronounced until their ultimate condition is reached in the adults (figs. 27, 31). The apophyses of the femora may be distally toothed (figs. 27, 31) (not always obvious in microslide preparations); those on the genua each bear *vG* distally, and those on the tibiae are usually simple. The development of the ventral apophyses is equal in males and females of all species except *Aralichus anodorhynchi*, n. sp., in which the males have each apophysis of the genua and tibiae extended into a distinct spine (fig. 31).

I have not been able to identify cupules in the immatures, even with SEM. In adults these structures are small and often expressed as small, circular depressions in heavily sclerotized areas. I assume that they are present in the immature stages.

Biology—I have never collected live mites from species of *Ara* or *Anodorhynchus*. From the numbers of specimens obtained from museum skins, I can assume that these species live on the wing feathers. This assumption is bolstered by biological studies on a species of the *canestrinii* complex from *Aratinga holochlora* (Sclater) in Mexico. These mites are on the ventral surfaces of the secondaries and inner primaries in the channels formed by adjacent barbs.

Immatures may enter exuviae of their species for molting (fig. 44). For a discussion of this phenomenon of thanatochresis, see Pérez and Atyeo (1984b).

There has always been speculation on the food of feather mites living on the surfaces of feathers. Fungal spores have been observed in the guts of a few mites, and it was believed that oils from the uropygial glands are ingested. Feathers heavily infested with feather mites have been examined under the scanning electron microscope, but damage could never be detected. During the biological studies mentioned above, I observed for the first time small particles of feathers in the foreguts; these particles were formed into spherical boli in the hind gut. This was observed in freshly mounted specimens; however, two or three days after preparation, the feather particles were no longer visible. In the past I have always allowed slides to dry before examining them—and so I have missed opportunities to discover that feather particles are ingested.

Hosts—All hosts for mites of the genus *Aralichus* are New World parrots. Forshaw (1978) assigned all of these parrots to the family Psittacidae, subfamily Psittacinae, but according to him this subfamily has both New and Old World representatives. A second classification was proposed by Wolters (1975), in which he places these same parrots in a number of subfamilies of the Psittacidae but restricts the Psittacinae to Old World species.

Wolters, 1975	*Forshaw, 1978*
Forpinae	Psittacinae (includes Old World taxa)
Aratinginae	
Brotogeryinae	
Amazoninae	
Triclariinae	
Pionitinae	
(Psittacinae, Old World)	
(Coracopinae, Madagascar)	

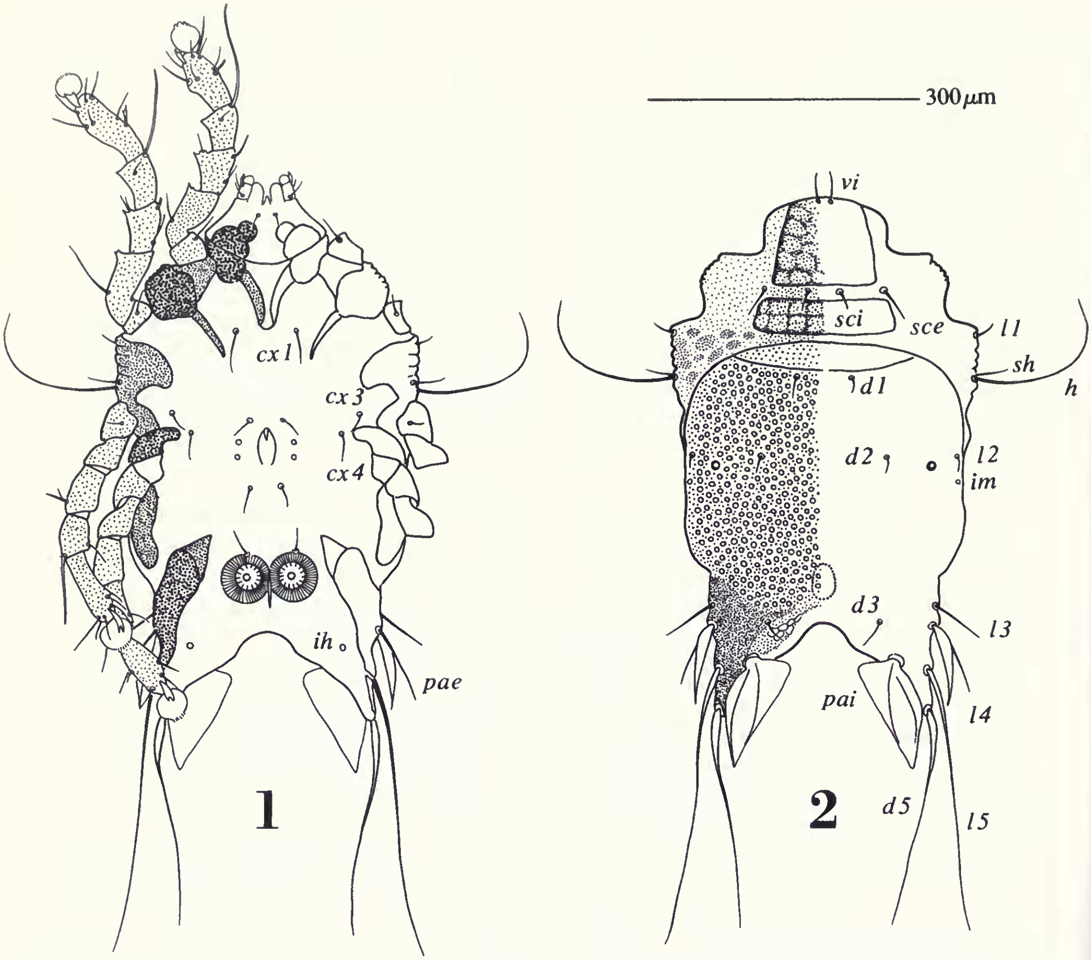
Species of the *Aralichus canestrinii* species complex are known only from genera of the Aratinginae, Pionitinae, and the Amazoninae (*sensu* Wolters).

Relationships—The relationships of *A. canestrinii* complex to *Distigmesikya, Echinofemur,* other *Aralichus* (*s.l.*) species groups, and to the New World species of *Protolichus* Trouessart are undetermined. Character-states used to define feather mite taxa are, at least in part, adaptations to life on feathers. The (apparently) same structural modifications can be found in mites assigned to different genera, families, and superfamilies associated with both non-passeriform and passeriform birds. Some convergences are explainable, e.g., ventral spines and excrescences on legs are for maintaining positions; enlarged legs III and/or IV of males are to hold nymphs and females; terminal lobes bearing variously modified terminal setae are presumably used to align the aedeagus with the minute female sperm pore; variously modified and elongated setae may be for orientation on feather surfaces; and so forth.

The immatures of all taxa have not been examined; however, from the information on hand, *Protolichus* species may be characterized as having thin, evenly striated dorsal tegument, whereas *Aralichus* and the aforementioned related taxa may be characterized in part by having broadly spaced and irregular striae (figs. 45–48).

Key to Males of the *Aralichus canestrinii* Complex from *Ara* and *Anodorhynchus*

1. Total length greater than 545 μm; posterior margins of setae *pai* as a point (figs. 8–10) or truncated (figs. 21, 24). 2
   Total length less than 485 μm; posterior margins of setae *pai* truncated (figs. 20, 22) 8
2. Posterior margins of setae *pai* as a point 3
   Posterior margins of setae *pai* truncated 7
3. Mean total length greater than 595 μm (OL = 570–640); mean total length of setae *pai* greater than 107 μm (OL = 102–120); mean distance between setae *d5* greater than 214 μm (OL = 201–247) 4
   Mean total length 566 μm (OL = 547–586); mean length of setae *pai* 99 μm (OL = 94–104); mean distance between setae *d5* 197 μm (OL = 181–205) . . . . *militaris,* n. sp.
4. Terminal cleft height greater than 99 μm (OL = 100–108) 5
   Mean terminal cleft height 95.8 μm (OL = 92–98) . . . . *chloropterae,* n. sp.
5. Seta *d* on tarsus IV dorsal at mid-length of segment (figs. 11–14) 6
   Seta *d* on tarsus IV dorsolateral, inserted distal to mid-length of segment (fig. 15) . . . . *ambiguae,* n. sp.
6. Terminal cleft as smooth arch (as in fig. 9) . . . . *mexicanus,* n. sp.
   Terminal cleft with sinuous margins (fig. 2) . . . . *canestrinii* (Trouessart)
7. Setae *pai* expanded anterior of setal base to level of setae *l4*; setae *d5* leaflike (fig. 24) . . . . *anodorhynchi,* n. sp.
   Setae *pai* not expanded anterior of setal base; setae *d5* setiform (fig. 21) . . . . . . *araraunae,* n. sp.
8. Hysterosomal shield with distinct pits; distance between pair *d1* ⅓–½ distance between pair *d2* 9
   Hysterosomal shield glabrous; distance *d1:d1* equal or greater than distance *d2:d2* . . . . *nobilis,* n. sp.
9. Setae *d5* expanded basally, leaflike 10
   Setae *d5* setiform . . . . *manilatae,* n. sp.
10. Setae *d5* S-shaped, almost symmetrical (fig. 20) 11
    Setae *d5* not S-shaped, strongly asymmetrical (base wider than in fig. 23) . . . *maracanae,* n. sp.
11. Length greater than 460 μm; width greater than 265 μm . . . . *severae,* n. sp.
    Length less than 445 μm; width less than 255 μm . . . . *couloni,* n. sp.



FIGS. 1–2. *Aralichus canestrinii* (Trouessart), male: **1,** ventral view; **2,** dorsal idiosoma. Abbreviations: *ih, im* = cupules; *cx1–4* = coxal setae; *d1–5, l1–5* = dorsal and lateral hysterosomal setae; *h* = humeral setae; *pae, pai* = external and internal postanal setae; *sce, sci* = external and internal scapular setae; *sh* = subhumeral setae; *vi* = internal vertical setae.

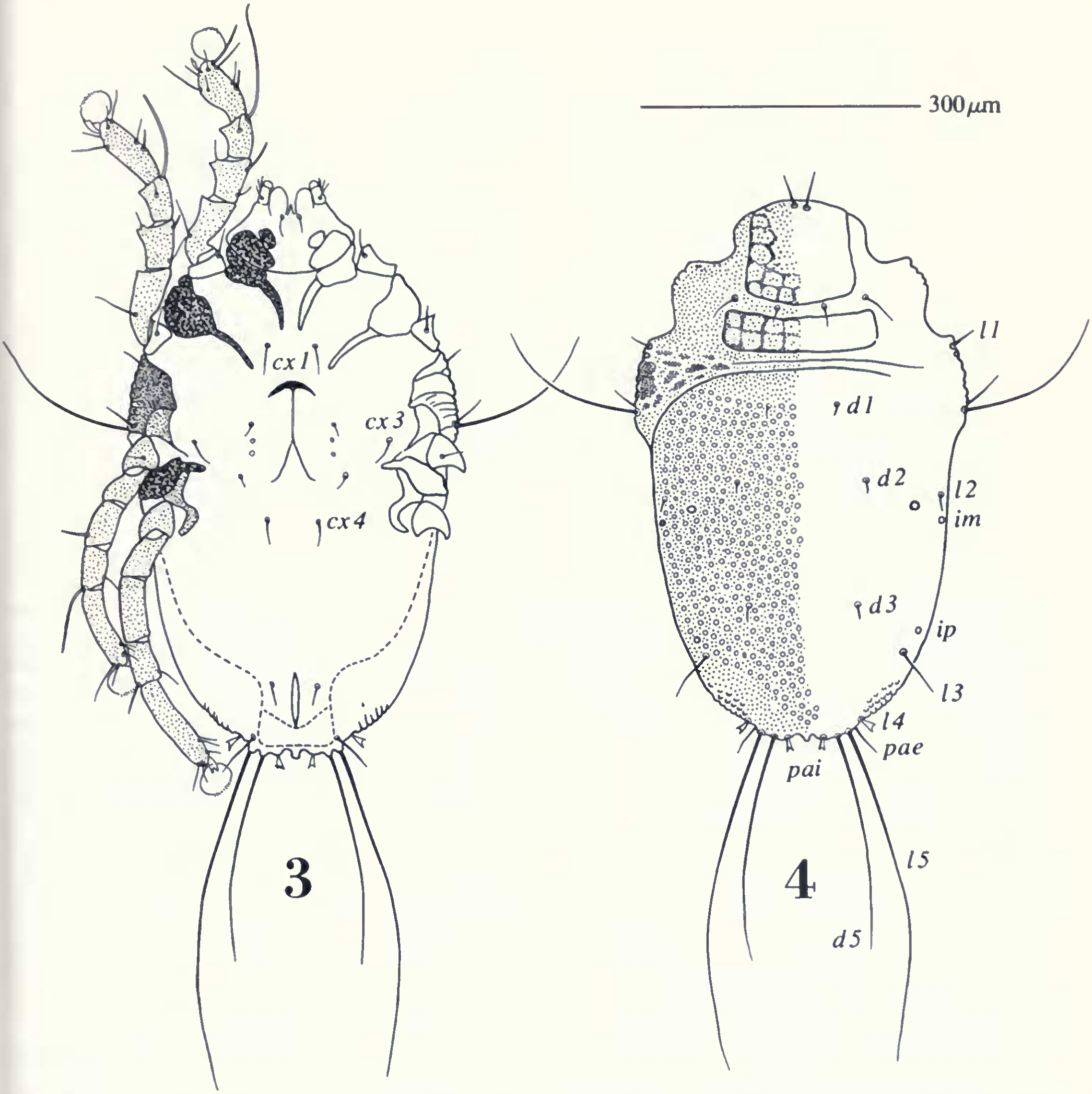
Males with Setae *pai* Triangular

Aralichus canestrinii (Trouessart). Figures 1–7, 11, 25–28, 32–40, 44.

Lectotype (here designated): Male, Trouessart Collection, Paris, slide number 35 I 2.
Type host: *Ara macao* (L.).
Type locality: South America.
Pterolichus (*P.*) *Canestrinii* Trouessart, 1885, pp. 115–116; Trouessart and Mégnin, 1885, pp. 22–23.
Pterolichus (*Eupterolichus*) *canestrinii*: Canestrini and Kramer, 1899, p. 38.
Pterolichus canestrinii: Favette and Trouessart, 1904, p. 124; Radford, 1958, p. 136.
Protolichus canestrinii: Dubinin, 1956, p. 304.
Aralichus canestrinii: Gaud, 1966, p. 121, fig. 3.

DIAGNOSIS—Male setae *pai* triangular and less than 107 μm in length, terminal cleft with sinuous margins, setae *l5* narrowly lanceolate and straight, setae *d* on tarsi IV dorsal.

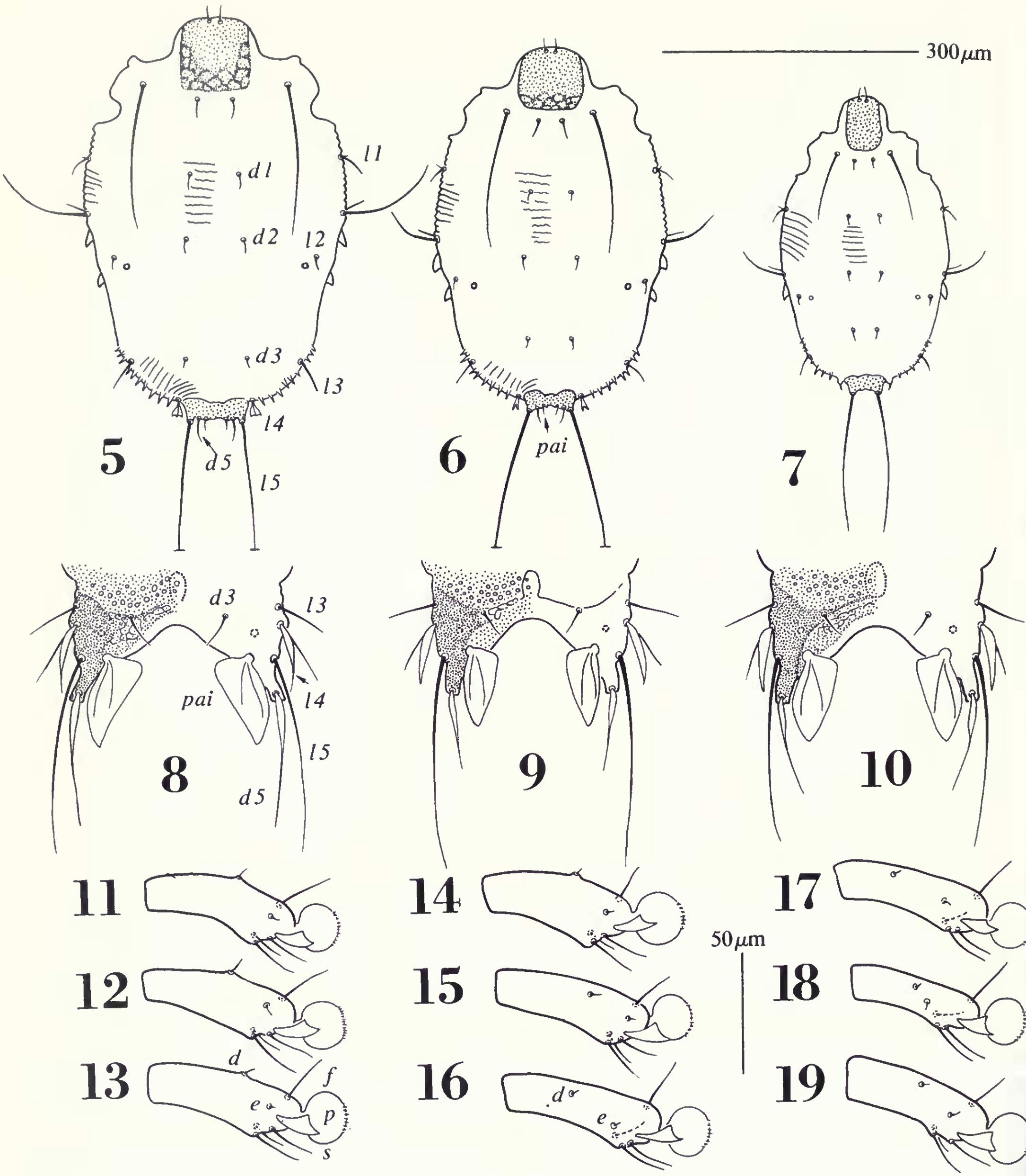
DESCRIPTION—**Male**—Length 598 ± 2.4 (OL = 571–640, N = 39); width 336 ± 1.3 (OL = 324–355, N = 34). Gnathosoma: 99.0 ± 0.4 (OL = 96.0–105.8, N = 38) × 136.6 ± 0.7 (OL = 129.7–147.0, N = 38). Prodorsum: Ornamentation well developed; *sce:sce* 130.9 ± 1.0 (OL = 119.6–147.0, N = 39); *sci:sci* 44.2 ± 1.0 (OL = 39.2–52.9, N = 39). Hysterosoma: Setae *pai* triangular, not expanded anterior to insertion; setae *d5* narrowly lanceolate, not S-shaped; measurements: *d1:d1* 69.8 ± 1.3 (OL = 49.0–86.2, N = 39): *d2:d2* 139.6 ± 1.5 (OL = 119.6–156.8, N = 39); *d3:d3* 118.4 ± 1.0 (OL =



FIGS. 3–4. *Aralichus canestrinii* (Trouessart), female: **3,** ventral view; **4,** dorsal idiosoma. Abbreviations: *im, ip* = cupules; *cx1–4* = coxal setae; *d1–5, l1–5* = dorsal and lateral hysterosomal setae; *pae, pai* = external and internal postanal setae.

105.8–133.3, N = 39); *d5:d5* 214.4 ± 1.4 (OL = 200.5–243.0, N = 36); *l5:l5* 222.3 ± 1.1 (OL = 208.2–250.7, N = 36); *d1:d2* 74.7 ± 1.1 (OL = 64.7–82.3, N = 38); *d2:d3* 177.6 ± 0.8 (OL = 164.6–192.1, N = 38); *d1:d3* 252.4 ± 0.8 (OL = 239.1–264.6, N = 38); *d3:pai* 42.5 ± 0.5 (OL = 37.2–50.9, N = 38); *pai:d5* 44.4 ± 0.5 (OL = 39.2–50.9, N = 38); *l5:d5* 44.2 ± 0.6 (OL = 37.2–54.9, N = 37); *l3* 72.6 ± 1.1 (OL = 62.7–84.3, N = 31); *pai* 108.6 ± 0.6 (OL = 103.9–119.6, N = 34); terminal cleft 104.6 (OL = 100.0–107.9, N = 7). Legs: Anterior legs with apicoventral apophyses moderately developed (fig. 27), setae *d* on tarsi IV inserted dorsal (fig. 11); measurements (femur to tarsus): I, 54.9–58.8 (60.8), 52.9–56.8, 47.0–50.9, 64.7–68.6 (72.5); II, 60.8–66.6, 54.9–58.8, 52.9–54.9 (56.8), 82.3–90.2 (90.1); III, 39.2–45.1, 52.9–56.8, 45.1–49.0, 82.2–90.2; IV, 39.2–43.1 (45.1), 56.8–62.7, 49.0–52.9, 92.1–96.0 (101.9).

Female—Length 635 (OL = 617–644, N = 6); width 348 (OL = 332–355, N = 6). Proterosoma and legs as in male. Gnathosoma: 106.2 (OL = 103.9–111.7, N = 6) × 148.0 (OL = 141.1–154.8, N = 6). Prodorsum: *sce:sce* 138.7 (OL = 133.3–



FIGS. 5–19. **5–7,** *Aralichus canestrinii* (Trouessart), tritonymph, protonymph, larva. **8–10,** Male termini: *A. chloropterae* (8), *A. militaris* (9), and *A. ambiguae* (10). **11–19,** Paraxial views of tarsi IV: *A. canestrinii* (11), *A. chloropterae* (12), *A. militaris* (13), *A. ambiguae* (14), *A. araraunae* (15), *A. manilatae* (16), *A. couloni* (17), *A. nobilis* (18), *A. anodorhynchi* (19). Abbreviations: *d1–5, l1–5* = dorsal and lateral hysterosomal setae; *pai* = internal postanal setae.

144.1, N = 6); *sci:sci* 46.4 (OL = 41.2–50.9, N = 6). Hysterosoma: Setae *l4, pai* leaflike with coarsely serrated margins; *d1:d1* 64.8 (OL = 58.8–70.6, N = 6); *d2:d2* 141.4 (OL = 131.3–150.9, N = 6); *d3:d3* 117.6 (OL = 107.8–125.4, N = 6); *d1:d2* 87.8 (OL = 84.3–92.1, N = 6); *d2:d3* 133.0 (OL = 123.5–143.1, N = 6); *d3:d5* 156.2 (OL = 147.0–170.5, N = 6); *d1:d5* 378.3 (OL = 360.6–386.1, N = 6); *l3* 57.2 (OL = 52.9–60.8, N = 5); *l4* 25.8 (OL = 23.5–29.4, N = 6); *pai* 18.4 (OL = 17.6–21.6, N = 5). Legs (femur to tarsus): I, 54.9–60.8, 54.9–56.9, 49.0–50.9, 66.6–70.6; II, 64.7–68.6, 56.8–58.8, 50.9–54.9, 86.2–92.1; III, 43.1–45.1, 54.9–60.8, 49.0, 88.2–96.0; IV, 49.0–54.9, 68.6–70.6, 54.9–58.8, 111.7–117.6.

TYPE MATERIAL—From *Ara macao*: **SOUTH AMERICA:** lectotype ♂, 2 ♂♂, 2 ♀♀ paralectotypes, no other data (TRT slide no. 35 I 2); 2 ♂♂, 1 ♀ paralectotypes, no other data (TRT slide no. 35 H 16); 3 ♂♂, 7 ♀♀ paralectotypes, no other data (2 TRT slides, no numbers). All types are in the Trouessart Collection, Paris.

ADDITIONAL MATERIAL—From *Ara macao*: **NICARAGUA:** 14 ♂♂, 4 ♀♀, 5 TNN, 5 PNN, 6 LL, and exuviae of 14 TN, 5 PN, 1 L. **HONDURAS:** 3 ♂♂, 1 ♀, 1 PN. **COSTA RICA:** 9 ♂♂, 1 L. **PANAMA:** 3 ♂♂. **COLOMBIA:** 17 ♂♂, 3 ♀♀ (2 collections).

DISCUSSION—**Relationships**—The males of *Aralichus canestrinii* and the new species *chloropterae, ambiguae, mexicanus,* and *militaris* each have large, triangular setae *pai* and long, basally lanceolate setae *d5*; seta *d* of tarsus IV is inserted dorsally. Tritonymphs of the first four named species have the external scapular setae widely separated and inserted dorsal between trochanters I and II; tritonymphs of *A. militaris* have the external scapulars inserted at the posterolateral corners of the prodorsal shield. Differences between the species are by measurements, the variations of the shapes of setae *pai,* configurations of the terminal clefts, and hosts.

Measurements of leg segments of an exceptionally large male are given in parentheses in the description. Illustrations are based on specimens from Colombia.

Aralichus chloropterae Atyeo, NEW SPECIES.
Figures 8, 12, 45.

Holotype: Male, Field Museum of Natural History.
Type host: *Ara chloroptera* (G. R. Gray).
Type locality: Orope, Tachira, Venezuela.

DIAGNOSIS—Male setae *pai* triangular and greater than 107 μm in length; setae *d5* lanceolate, terminal cleft with sinuous margins and less than 99 μm in height; setae *d* on tarsi IV dorsal.

DESCRIPTION—**Male**—Length 596 ± 2.9 (OL = 578–619, N = 20); width 346 ± 2.3 (OL = 328–359, N = 18). Gnathosoma: 99.5 ± 0.4 (OL = 96.0–101.9, N = 12) × 138.6 ± 0.7 (OL = 133.3–145.0, N = 20). Prodorsum: Ornamentation well developed; *sce*:*sce* 132.8 ± 1.2 (OL = 119.6–147.1, N = 20); *sci*:*sci* 46.1 ± 0.8 (OL = 38.2–52.9, N = 20). Hysterosoma: Setae *pai* triangular, not expanded anterior to insertion; setae *d5* narrowly lanceolate, not S-shaped; measurements: *d1*:*d1* 76.1 ± 2.4 (OL = 54.9–96.0, N = 20); *d2*:*d2* 141.5 ± 2.1 (OL = 123.5–160.7, N = 20); *d3*:*d3* 120.7 ± 1.1 (OL = 109.8–127.4, N = 20); *d5*:*d5* 231.7 ± 1.2 (OL = 223.6–246.7, N = 18); *l5*:*l5* 233.9 ± 1.2 (OL = 227.6–243.0, N = 18); *d1*:*d2* 75.8 ± 1.6 (OL = 64.7–92.1, N = 20); *d2*:*d3* 179.1 ± 1.4 (OL = 168.6–194.0, N = 20); *d1*:*d3* 254.9 ± 2.5 (OL = 235.2–278.3, N = 20); *d3*:*pai* 43.5 ± 0.7 (OL = 39.2–49.0, N = 20); *pai*:*d5* 42.1 ± 0.6 (OL = 39.2–47.0, N = 20); *l5*:*d5* 42.0 ± 0.7 (OL = 38.2–50.9, N = 20); *l3* 73.4 ± 1.3 (OL = 66.6–86.2, N = 15); *pai* 108.6 ± 0.7 (OL = 101.9–115.6, N = 19); terminal cleft 95.8 (OL = 92.1–98.0, N = 8). Anterior legs with apicoventral apophyses moderately developed (as in fig. 27), setae *d* on tarsi IV inserted dorsal (fig. 12); measurements (femur to tarsus): I, 52.9–60.8, 52.9–54.9, 47.0–50.9, 68.6–72.5; II, 58.8–64.7, 54.9–58.8, 50.9–54.9, 86.2–90.2; III, 39.2–43.1, 52.9–58.8, 45.1–47.0, 84.3–90.2; IV, 39.2–41.2, 56.8–62.7, 49.0–52.9, 92.1–96.0 (101.9).

Female—Length 633 ± 2.2 (OL = 617–648, N = 17); width 356 ± 2.0 (OL = 339–370, N = 15). Proterosoma and legs as in male. Gnathosoma: 107.0 ± 0.6 (OL = 101.9–111.7, N = 18) × 145.5 ± 1.3 (OL = 131.3–152.9, N = 17). Prodorsum: *sce*:*sce* 139.6 ± 2.1 (OL = 117.6–150.9, N = 18); *sci*:*sci* 48.3 ± 1.4 (OL = 39.2–62.7, N = 17). Hysterosoma: Setae *l4, pai* leaflike with coarsely serrated margins; *d1*:*d1* 72.9 ± 1.8 (OL = 62.7–88.2, N = 17); *d2*:*d2* 143.6 ± 2.1 (OL = 131.3–164.6, N = 15); *d3*:*d3* 110.7 ± 1.5 (OL = 98.0–121.5, N = 16); *d1*:*d2* 91.5 ± 1.2 (OL = 82.3–98.0, N = 18); *d2*:*d3* 130.2 ± 2.3 (OL = 113.7–152.9, N = 18); *d3*:*d5* 159.5 ± 2.4 (OL = 137.2–172.5, N = 17); *d1*:*d5* 381.5 ± 3.3 (OL = 358.7–405.7, N = 17); *l3* 55.2 ± 1.6 (OL = 41.2–64.7, N = 17); *l4* 22.2 (OL = 19.6–23.5, N = 6); *pai* 16.0 (OL = 13.7–19.6, N = 6). Legs (femur to tarsus): I, 54.9–64.7, 52.9–56.8, 46.0–49.0, 66.6–72.5 (82.3); II, 66.6, 56.8–58.8, 54.9, 92.1–94.1; III, 39.2–49.0, 54.9–60.8 (62.7), 45.1–49.0, 88.2–98.0 (107.8); IV, 43.1–49.0, 64.7–74.5, 52.9–58.8, 103.9–117.6.

TYPE DATA (ONLY ADULTS AS TYPES)—From *Ara chloroptera* (G. R. Gray): **VENEZUELA: Tachira:** Orope, holotype ♂, 5 ♂♂, 2 ♀♀, 7 March 1908, N. Dearborn (FMNH 34,368; UGA 11,384) and 2 ♂♂, 8 March 1908 (FMNH 34,367; UGA 11,383); **Delta Amacuro:** Piacoa, 2 ♂♂, 1 ♀, 22 January 1932, E. R. Blake (FMNH 81,440; UGA 11,385); San Mateo de Caicara, 4 ♂♂, 4 ♀♀, 1 L, 23 May 1905, G. K.

Cherrie (AMNH 178,137; UGA 10,339). **COLOMBIA: Arauca:** Río Arauca, 1 ♂, 2 ♀♀, 2 April 1959, K. von Sneidern (FMNH 161,082; UGA 11,380) and 2 ♀♀, 30 March 1959 (FMNH 261,080; UGA 11,382); Bojabá, 1 ♂, 3 TNN, 16 March 1959, K. von Sneidern (FMNH 261,081; UGA 11,381); **Antioquia:** Río Cauca, Puerto Valdivia, 3 ♂♂, 1 ♀, 19 December 1914, Miller and Boyle (AMNH 133,009; UGA 10,338); Cuturú, 2 TNN, 3 PNN, 4 August 1947, K. von Sneidern (FMNH 190,745; UGA 11,379). **BOLIVIA:** (?El Beni), 10 km W San Pedro, 2 ♂♂, 2 ♀♀, 15 September 1965, collectors unknown (AMNH 819,197; UGA 10,341). **BRAZIL: Mato Grosso:** Chapada, 3 ♂♂, 3 ♀♀, 2 TNN, 19 October 1883, H. H. Smith (AMNH 34,525; UGA 10,342). Paratypes are deposited in AMNH, FMNH, GAUD, LAS, NMNH, TRT, UGA, UNAM.

DISCUSSION—**Relationships**—*Aralichus canestrinii* and this new species are very similar. The only consistent difference between the males is the configuration of the terminal cleft. In *canestrinii,* the distances between setal pairs *l5* and *d5* are, respectively, 222 and 214 μm (OL = 208–251 and 200–243); the cleft height measured from the lobe apices to the sclerotized cleft apex is 104 μm (OL = 100–108); in *chloropterae* the same structures are 234, 232, and 96 μm (OL = 228–243, 224–247, and 92–98).

One male and one female had some quite large leg segments; these are given in parentheses in the description.

Aralichus militaris Atyeo, NEW SPECIES. Figures 9, 13.

Holotype: Male, deposited at Field Museum of Natural History.
Type host: *Ara m. militaris* (L.).
Type locality: Marcapata, Cuzco, Peru.

DIAGNOSIS—Male setae *pai* triangular and less than 104 μm in length, the terminal cleft is a smooth arch between 92 and 102 μm in height, setae *d5* are lanceolate, and setae *d* on tarsi IV are dorsal.

DESCRIPTION—**Male**—Length 566 ± 2.5 (OL = 547–586, N = 17); width 328 ± 1.7 (OL = 316–339, N = 17). Gnathosoma: 90.9 ± 0.5 (OL = 88.2–94.1, N = 17) × 128.0 ± 1.1 (OL = 119.6–137.2, N = 17). Prodorsum: Ornamentation well developed; *sce*:*sce* 121.3 ± 1.7 (OL = 107.8–135.2, N = 17); *sci*:*sci* 44.6 ± 1.0 (OL = 37.2–52.9, N = 17). Hysterosoma: Setae *pai* triangular, not expanded anterior to insertion; setae *d5* narrowly lanceolate, not S-shaped; measurements: *d1*:*d1* 68.9 ± 1.6 (OL = 58.5–80.4, N = 16); *d2*:*d2* 123.4 ± 2.5 (OL 107.8–143.1, N = 17); *d3*:*d3* 112.2 ± 1.3 (OL = 101.9–119.6, N = 17); *d5*:*d5* 197.1 ± 1.6 (OL = 181.3–204.5, N = 17); *l5*:*l5* 212.9 ± 1.5 (OL = 200.5–223.6, N = 17); *d1*:*d2* 81.3 ± 1.8 (OL = 70.6–94.1, N = 17); *d2*:*d3* 172.5 ± 1.4 (OL = 160.7–184.2, N = 17); *d1*:*d3* 254.9 ± 2.1 (OL = 241.1–274.4, N = 17); *d3*:*pai* 41.5 ± 0.7 (OL = 37.2–45.1, N = 17); *pai*:*d5* 42.1 ± 0.7 (OL = 35.3–49.0, N = 17); *l5*:*d5* 41.2 ± 0.5 (OL = 39.2–45.1, N = 17); *l3* 66.3 ± 1.2 (OL = 60.8–72.5, N = 10); *pai* 98.8 ± 0.6 (OL = 94.1–103.9, N = 17); terminal cleft 94.7 ± 0.7 (OL = 92.1–101.9, N = 16). Legs: Anterior legs with apicoventral apophyses moderately developed (as in fig. 27); setae *d* on tarsi IV inserted dorsal (fig. 13); measurements (femur to tarsus): I, 50.9–56.8, 50.9–54.9, 43.0–47.0, 62.7–68.6; II, 54.9–58.8, 52.9–54.9, 47.0–50.9, 78.4–84.3; III, 35.3–39.2, 50.9–54.9, 43.1–47.0, 80.4–88.2; IV, 37.2–41.2, 56.8–60.8, 45.1–49.0, 88.2–92.1.

Female—Length 600 (OL = 594–601, N = 5); width 325 (OL = 305–336, N = 5). Proterosoma and legs as in male. Gnathosoma: 94.1 (OL = 92.1–98.0, N = 5) × 132.5 (OL = 125.4–139.2, N = 5). Prodorsum: *sce*:*sce* 123.7 (OL = 117.6–129.4, N = 5); *sci*:*sci* 46.5 (OL = 43.1–49.0, N = 5). Hysterosoma: Setae *l4, pai* leaflike with coarsely serrated margins; *d1*:*d1* 75.5 (OL = 66.6–86.6, N = 5); *d2*:*d2* 126.6 (OL = 121.5–135.2, N = 5); *d3*:*d3* 112.5 (OL = 101.9–119.6, N = 5); *d1*:*d2* 85.1 (OL = 80.4–88.2, N = 5); *d2*:*d3* 137.2 (OL = 129.4–147.0, N = 5); *d3*:*d5* 142.3 (OL = 135.2–149.0, N = 4); *d1*:*d5* 364.6 (OL = 358.7–370.4, N = 5); *l3* 75.6 (OL = 43.1–49.0, N = 4); *l4* 19.6 (N = 2); *pai* 17.6 (OL = 15.7–19.6, N = 2). Legs (femur to tarsus): I, 50.9–54.9, 50.9–52.9, 45.1–49.0, 66.6–68.6; II, 54.9–58.8, 52.9–54.9, 49.0–50.9, 84.3–90.2; III, 39.2–40.1, 54.9–56.8, 47.0–50.9, 83.3–88.2; IV, 41.2–45.1, 64.7–66.6, 50.9–54.9, 94.1–103.9.

TYPE DATA (ONLY ADULTS AS TYPES)—From *Ara m. militaris*: **PERU: Cuzco:** Marcapata, ♂ holotype, 8 ♂♂, 5 ♀♀, 3 TNN, 1 PN and 1 L cast skin, 28 May 1949, C. Kalinowski (FMNH 208,166; UGA 11,507); **Ucayali:** Fundo Cinchona (= Huánuco = Fundo Sinchona), 8 ♂♂, 1 TN, 7 September 1922, J. T. Zimmer (FMNH 59,540; UGA 11,509). Paratypes are deposited in FMNH, GAUD, UGA, UNAM.

DISCUSSION—**Relationships**—The adults of this new species occur on *Ara m. militaris. Aralichus mexicanus,* a related and somewhat larger species, is known from a host subspecies from Mexico. In additions to differences in general size, the heights

TABLE 2. Distances (in μm) between the external (*sce*) and internal (*sci*) scapular setae of the immature stadia of *Aralichus militaris* and *A. mexicanus.*

			sce:sce		*sci:sci*	
Stage	Species	N	$\bar{x}$ ± SE	OL	$\bar{x}$ ± SE	OL
TN	*mexicanus*	17	187.5 ± 2.2	175.2–203.8	33.2 ± 0.7	29.4–39.2
	militaris	7	106.2 ± 3.2	92.1–115.6	28.0 ± 1.2	21.6–31.4
PN	*mexicanus*	6	94.4 ± 1.8	90.2–102.9	26.3 ± 0.7	24.5–29.4
	militaris	6	76.4 ± 0.9	72.5–78.4	24.2 ± 2.3	21.7–27.4
L	*mexicanus*	4	67.4 ± 1.7	62.7–70.6	21.3 ± 1.5	19.6–26.6
	militaris	5	59.4 ± 1.3	55.9–62.7	20.0 ± 1.3	17.6–25.5

SE = Standard error, OL = observed limits, TN = tritonymph, PN = protonymph, L = larva.

of the male terminal clefts are useful in separating these species: *militaris,* 92–102 μm, and for *mexicanus,* 100–108 μm.

There are obvious size differences between the adults of *Aralichus militaris* and *A. mexicanus,* but between *A. militaris, A. canestrinii,* and *A. chloropterae,* these differences are not as pronounced. However, immatures of the species being described are quite distinct from those of the four described above, in that the external scapular setae of the tritonymphs are inserted near the posterolateral angles of the prodorsal shield rather than in the interspace above trochanters I and II. Using the mite species from the subspecies of *Ara militaris* as the illustration, the external scapulars are more distant in all stages of *Aralichus mexicanus* than in *Aralichus militaris* (Table 2).

Aralichus mexicanus Atyeo, NEW SPECIES.

Holotype: Male, deposited at American Museum of Natural History.
Type host: *Ara militaris mexicana* (Ridgway).
Type locality: Los Peñas, Jalisco, Mexico.

DIAGNOSIS—Male setae *pai* triangular and greater than 102 μm in length, setae *d5* straight, terminal cleft smooth and 100–108 μm in height, setae *d* on tarsi IV dorsal.

DESCRIPTION—**Male**—Length 604 ± 4.6 (OL = 571–632, N = 12); width 344 ± 2.1 (OL = 332–355, N = 11). Gnathosoma: 96.5 ± 0.7 (OL = 92.1–100.0, N = 12) × 135.1 ± 1.1 (OL = 127.4–141.1, N = 11). Prodorsum: Ornamentation well developed; *sce:sce* 128.7 ± 2.3 (OL = 113.7–137.2, N = 12); *sci:sci* 44.6 ± 1.5 (OL = 37.2–52.9, N = 12). Hysterosoma: Setae *pai* triangular, not expanded anterior to insertion; setae *d5* narrowly lanceolate, not S-shaped; measurements: *d1:d1* 62.7 ± 1.3 (OL = 58.8–68.6, N = 11); *d2:d2* 120.5 (OL = 88.2–133.3, N = 8); *d3:d3* 123.2 ± 2.0 (OL = 107.8–133.3, N = 12); *d5:d5* 219.7 ± 0.2 (OL = 200.5–227.6, N = 12); *l5:l5* 226.8 ± 0.4 (OL = 215.9–235.3, N = 12); *d1:d2* 81.5 ± 2.1 (OL = 72.5–92.1, N = 12); *d2:d3* 188.0 ± 2.7 (OL = 176.4–203.8, N = 11); *d1:d3* 268.9 ± 4.0 (OL = 248.9–288.1, N = 11); *d3:pai* 45.7 ± 0.6 (OL = 39.2–49.0, N = 12); *pai:d5* 45.2 ± 0.8 (OL = 41.2–50.9, N = 12); *l5:d5* 46.1 ± 0.8 (OL = 41.2–50.0, N = 12); *l3* 73.8 (OL = 54.9–88.2, N = 8); *pai* 107.2 ± 1.4 (OL = 98.0–113.7, N = 12); terminal cleft 103.2 (OL = 100.0–107.9, N = 9). Legs: Anterior legs with apicoventral apophyses moderately developed (as in fig. 27); setae *d* on tarsi IV inserted dorsal; measurements (femur to tarsus): I, 53.8–58.8, 50.9–54.9, 47.0–49.0, 64.7–66.6; II, 58.8–64.7, 54.9–56.8, 53.8–55.8, 84.3–90.2; III, 39.2–41.2, 54.9–60.8, 45.1–49.0, 86.2–90.2 (94.1); IV, 39.2–45.1, 58.8–62.7, 47.0–50.9, 92.1–101.9.

Female—Length 641 (OL = 632–648, N = 5); width 355 (OL = 347–362, N = 5). Proterosoma and legs as in male. Gnathosoma: 105.4 (OL = 103.9–105.8, N = 5) × 145.8 (OL = 141.1–147.0, N = 5). Prodorsum: *sce:sce* 136.0 (OL = 127.4–141.1, N = 5); *sci:sci* 42.7 (OL = 39.2–47.0, N = 5). Hysterosoma: Setae *l4, pai* leaflike with coarsely serrated margins; *d1:d1* 65.9 (OL = 58.8–74.5, N = 5); *d2:d2* 126.2 (OL = 113.7–139.2, N = 5); *d3:d3* 109.8 (OL = 105.8–115.6, N = 5); *d1:d2* 86.6 (OL = 80.4–92.1, N = 5); *d2:d3* 141.7 (OL = 127.4–149.0, N = 5); *d3:d5* 154.1 (OL = 143.1–168.6, N = 5); *d1:d5* 381.2 (OL = 376.3–392.0, N = 5); *l3* 50.2 (OL = 43.1–56.8, N = 5); *l4* 20.9 (OL = 19.6–21.6, N = 3); *pai* 15.2 (N = 2). Legs (femur to tarsus): I, 50.9–58.8, 54.9, 49.0–50.9, 49.0–50.0, 66.6–74.5; II, 60.8–64.7, 56.8–58.8, 50.9–54.9, 86.2–88.2; III, 41.2–47.0, 56.8–60.8, 47.0–49.0, 88.2–94.2; IV, 49.0–52.9, 69.6–72.5, 54.9–60.8, 113.7–117.6.

TYPE DATA (ONLY ADULTS AS TYPES)—From *Ara militaris mexicana*: **MEXICO: Jalisco:** Los Peñas,

♂ holotype, 9 ♂♂, 4 ♀♀, 12 TNN, 5 PNN, 4 LL, 7 TN exuviae, 4 PN exuviae, 26 April 1909, P. I. Osburn (AMNH 393,339; UGA 10,316); locality unknown, 2 ♂♂, 1 ♀, 1902, G. F. Breniger (FMNH 12,735; UGA 11,502); **Southern Sinaloa:** 2 LL, no date, J. H. Batty (AMNH 92,841; UGA 10,317). Paratypes are deposited in AMNH, FMNH, UGA, UNAM.

DISCUSSION—**Relationships**—This is the last species in a cluster of four closely related species characterized in part by attributes of the nymphal instars, that is, widely separated external scapular setae. *Aralichus mexicanus* and *A. militaris*, n. sp., are from the military macaw, the former species from Mexico, the latter species from Peru. The adults of these two *Aralichus* species differ in general size, with *mexicanus* being the larger.

Aralichus ambiguae Atyeo, NEW SPECIES. Figures 10, 14, 46.

Holotype: Male, deposited at American Museum of Natural History.
Type host: *Ara ambigua* (Bechstein).
Type locality: Limón, Costa Rica.

DIAGNOSIS—Male setae *pai* triangular and greater than 102 μm in length, terminal cleft sinuous and 102–108 μm in height; setae *d5* straight, setae *d* on tarsi IV dorsal.

DESCRIPTION—**Male**—Length 608 ± 2.4 (OL = 586–636, N = 25); width 346 ± 1.6 (OL = 332–362, N = 25). Gnathosoma: 99.2 ± 0.5 (OL = 96.0–103.9, N = 25) × 138.1 ± 0.6 (OL = 133.3–145.0, N = 25). Prodorsum: Ornamentation well developed; *sce:sce* 136.3 ± 1.0 (OL = 127.4–147.0, N = 25); *sci:sci* 47.2 ± 0.6 (OL = 41.2–51.9, N = 25). Hysterosoma: Setae *pai* triangular, not expanded anterior to insertion; setae *d5* narrowly lanceolate, not S-shaped; measurements: *d1:d1* 66.2 ± 1.4 (OL = 54.9–84.3, N = 25); *d2:d2* 150.0 ± 1.4 (OL = 121.5–154.8, N = 25); *d3:d3* 125.9 ± 1.4 (OL = 113.7–135.2, N = 24); *d5:d5* 231.1 ± 2.0 (OL = 212.2–250.7, N = 22); *l5:l5* 236.7 ± 1.5 (OL = 219.9–250.7, N = 23); *d1:d2* 81.4 ± 0.9 (OL = 74.5–88.2, N = 25); *d2:d3* 182.8 ± 1.2 (OL = 172.5–196.0, N = 25); *d1:d3* 263.8 ± 1.3 (OL = 254.8–282.2, N = 25); *d3:pai* 46.7 ± 0.6 (OL = 39.2–52.9, N = 24); *pai:d5* 46.8 ± 0.6 (OL = 43.1–54.9, N = 25); *l5:d5* 46.7 ± 0.7 (OL = 39.2–52.9, N = 25); *l3* 64.7 ± 1.0 (OL = 56.8–74.5, N = 16); *pai* 109.6 ± 0.7 (OL = 101.9–117.6, N = 25); terminal cleft 103.6 (OL = 101.9–107.9, N = 7). Anterior legs with apicoventral apophyses moderately developed (as in fig. 27); setae *d* on tarsi IV inserted dorsal (fig. 14); measurements (femur to tarsus): I, 54.9–60.8, 54.9–58.8, 49.0–52.9, 68.6–74.5; II, 60.8–66.6, 58.8–62.7, 54.9–59.7, 83.4–94.1 (98.0); III, 41.2–45.1, 54.9–59.7, 49.0–52.9, 88.2–96.0 (101.9); IV, 39.2–43.1, 60.8–63.6, 50.9–54.9, 98.0–103.9.

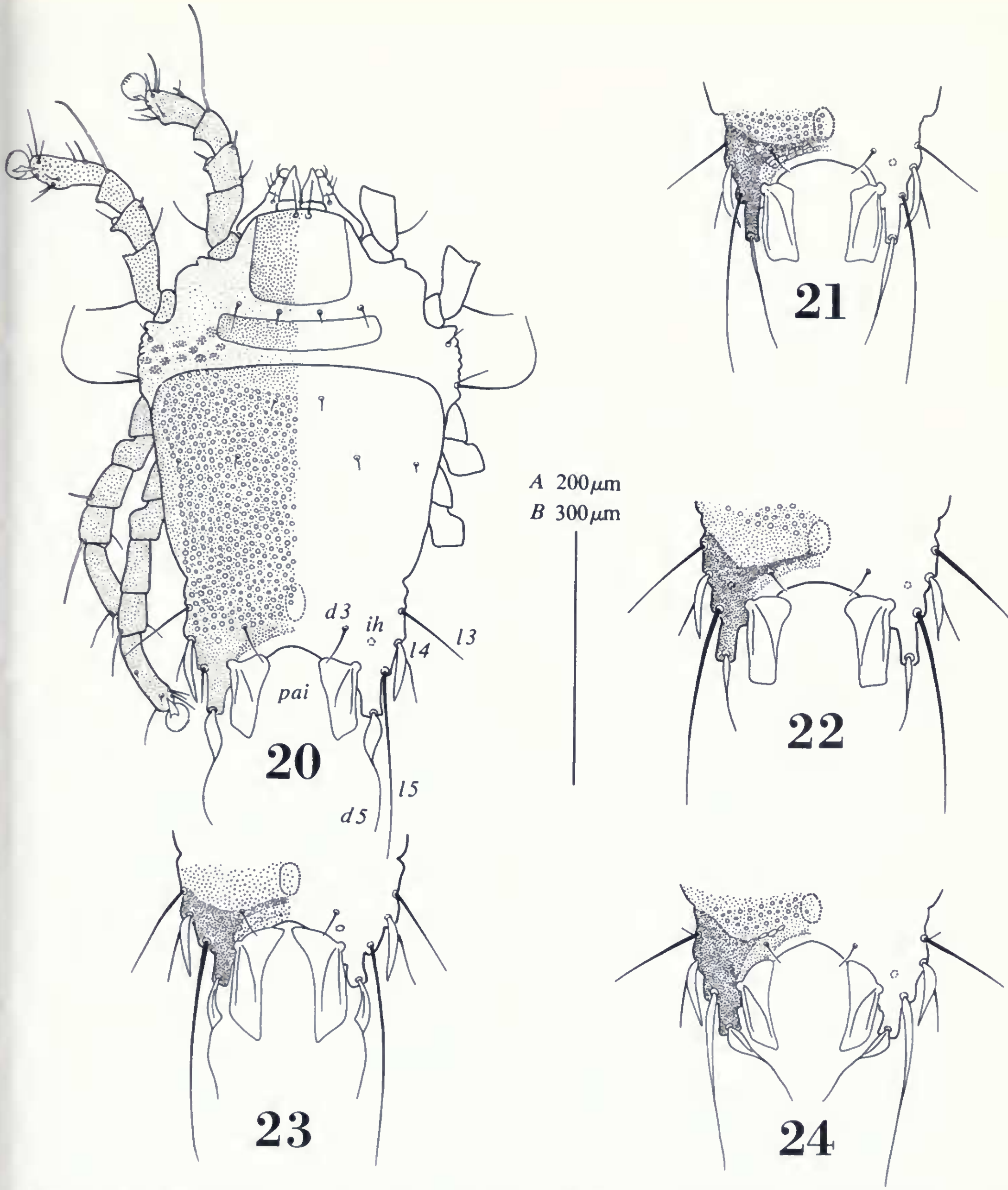
Female—Length 658 ± 3.8 (OL = 644–686, N = 10); width 354 (OL = 324–370, N = 9). Proterosoma and legs as in male. Gnathosoma: 106.9 ± 0.9 (OL = 103.9–111.7, N = 10) × 146.6 ± 1.3 (OL = 141.1–154.8, N = 10). Prodorsum: *sce:sce* 141.5 ± 1.9 (OL = 133.3–152.9, N = 10); *sci:sci* 50.0 ± 1.0 (OL = 45.1–55.9, N = 10). Hysterosoma: Setae *l4*, *pai* leaflike with coarsely serrated margins; *dl:dl* 69.2 ± 1.5 (OL = 60.8–78.4, N = 10); *d2:d2* 145.0 ± 3.3 (OL = 131.7–168.6, N = 10); *d3:d3* 117.6 ± 2.4 (OL = 103.9–127.4, N = 10); *d1:d2* 97.5 ± 1.7 (OL = 88.2–103.9, N = 10); *d2:d3* 140.7 ± 2.3 (OL = 133.3–158.5, N = 10); *d3:d5* 156.8 (OL = 147.0–172.5, N = 9); *d1:d5* 393.7 (OL = 376.3–407.7, N = 9); *l3* 45.1 (OL = 43.1–54.9, N = 9); *l4* 21.2 (OL = 17.6–23.5, N = 9); *pai* 16.1 (OL = 11.8–19.6, N = 9). Legs (femur to tarsus): I, 56.8–58.8, 56.8–58.8, 49.0–50.9, 72.5–76.4; II, 64.7–68.8, 58.8–60.8, 52.9–56.8, 92.1–94.1; III, 41.2–45.1, 58.8–60.8, 47.0–50.9, 92.1–98.0; IV, 50.9–54.9, 70.6–74.5, 56.8–60.8, 113.7–117.6.

TYPE DATA (ONLY ADULTS AS TYPES)—From *Ara ambigua*: **COSTA RICA: Limón:** ♂ holotype, 5 ♂♂, 1 ♀, 28 December 1924, Austin-Smith (AMNH 389,257; UGA 10,320). **PANAMA: Bocas del Toro:** Almirante, 1 ♂, 1 ♀, 4 July 1927, R. R. Benson (AMNH 247,345; UGA 10,321). **NICARAGUA: Matagalpa:** (?Savala), 5 ♂♂, 6 ♀♀, 7 TNN, 9 PNN, 9 October 1907, W. B. Richardson (AMNH 102,433; UGA 10,318); Matagalpa, 7 ♂♂, 2 ♀♀, 1 TN, 3 PNN, 3 TN exuviae, 8 September 1904, W. B. Richardson (AMNH 474,252; UGA 10,319). Paratypes are deposited in AMNH, FMNH, GAUD, LAS, TRT, UGA, UNAM.

DISCUSSION—**Relationships**—The males of *Aralichus ambiguae, A. mexicanus,* and *A. canestrinii* are approximately the same size. However, the females of *A. ambiguae* are distinctly larger than the other two species; the lower limit of 644 μm for total length is equal to or greater than the upper limits for *A. mexicanus* and *A. canestrinii.*

Males with Setae *pai* Truncated

The remaining taxa are more easily characterized than *A. canestrinii* and closely related species.



FIGS. 20–24. **20,** *Aralichus couloni,* male, dorsal view. **21–24,** Male termini: *A. araraunae* (21), *A. manilatae* (22), *A. nobilis* (23), *A. anodorhynchi* (24). Abbreviations: *ih* = cupule; *d3–5, l3–5* = dorsal and lateral hysterosomal setae; *pai* = internal postanal setae. Scale A = Figures 20, 22–23; scale B = Figures 21, 24.

Males of the following species have setae *pai* truncated rather than triangular, and a few of the species have *pai* expanded anterior to the setal bases (figs. 20, 23). Setae *d5* are lanceolate, or expanded basally into an almost symmetrical "S" configuration (fig. 20) or into strongly asymmetrical setae (fig. 23). Setae *d* of tarsi IV are positioned dorsolaterally rather than dorsally. Females are similar to *A. canestrinii.* The immatures have the scapular setae positioned as in *A. militaris,* usually rows of spines along the terminal edge of the idiosomata, and setae *d5* short (about 25 μm) to more than half the length of setae *l5*. Patterns on the prodorsal and hysterosomal shields are varied, from absent to well developed.

Aralichus araraunae Atyeo, NEW SPECIES. Figures 15, 21, 41–43.

Holotype: Male, deposited at American Museum of Natural History.
Type host: *Ara ararauna* (L.).
Type locality: Río Tuira, El Real, Panama.

DIAGNOSIS—Male setae *pai* apically quadrate, not expanded anterior to setal base; setae *d5* setiform (narrowly lanceolate); total length 570–595 μm.

DESCRIPTION—**Male**—Length 584 ± 1.2 (OL = 570–594, N = 16); width 317 ± 1.7 (OL = 308–332, N = 16). Gnathosoma: 98.5 ± 0.3 (OL = 96.0–101.9, N = 15) × 124.5 ± 1.0 (OL = 117.6–131.3, N = 16). Prodorsum: Ornamentation well developed; *sce*:*sce* 117.5 ± 1.0 (OL = 107.8–127.4, N = 16); *sci*:*sci* 39.3 ± 0.8 (OL = 31.4–44.1, N = 16). Hysterosoma: Setae *pai* truncated, not expanded anterior to insertion; setae *d5* setiform (narrowly lanceolate), not S-shaped; measurements: *d1*:*d1* 71.3 ± 1.6 (OL = 62.7–88.2, N = 16); *d2*:*d2* 137.1 ± 2.0 (OL = 125.7–149.0, N = 13); *d3*:*d3* 134.4 ± 1.6 (OL = 126.4–147.0, N = 16); *d5*:*d5* 183 ± 0.8 (OL = 161.9–212.2, N = 15); *l5*:*l5* 202.9 ± 2.0 (OL = 189.0–219.9, N = 15); *d1*:*d2* 85.7 ± 1.1 (OL = 78.4–92.1, N = 15); *d2*:*d3* 158.5 ± 1.5 (OL = 147.0–168.6, N = 15); *d1*:*d3* 244.2 ± 1.7 (OL = 235.2–256.8, N = 15); *d3*:*pai* 41.8 ± 0.6 (OL = 36.3–45.1, N = 16); *pai*:*d5* 53.7 ± 0.7 (OL = 49.0–56.8, N = 16); *l5*:*d5* 37.7 ± 0.5 (OL = 35.3–41.2, N = 16); *l3* 105.4 ± 1.7 (OL = 94.1–113.7, N = 11); *pai* 100.6 ± 0.8 (OL = 96.0–105.8, N = 15); terminal cleft 102.2 ± 0.8 (OL = 100.2–107.9, N = 16). Legs: Anterior legs with apicoventral apophyses moderately developed (as in fig. 27); setae *d* on tarsi IV inserted dorsolateral (fig. 15); measurements (femur to tarsus): I, 54.9–60.8, 53.8–58.8, 47.0–50.9, 68.6–72.5; II, 60.8–62.7, 61.7–62.7, 54.9–58.8, 90.2–94.1; III, 41.2–45.1, 54.9–56.8, 45.1–47.0, 88.2–90.2; IV, 45.1–47.0, 56.8–58.8, 49.0–50.9, 98.0–100.0.

Female—Length 621 (OL = 617–625, N = 4); width 324 (316–332, N = 4). Proterosoma and legs as in male. Gnathosoma: 102.9 (101.9–103.9, N = 4) × 131.2 (OL = 129.4–133.2, N = 4). Prodorsum: *sce*:*sce* 124.0 (OL = 121.5–125.4, N = 4); *sci*:*sci* 37.7 (OL = 35.3–41.2, N = 4). Hysterosoma: Setae *l4, pai* leaflike with coarsely serrated margins; *d1*:*d1* 67.6 (OL = 62.7–76.4, N = 4); *d2*:*d2* 135.2 (OL = 129.4–139.4, N = 4); *d3*:*d3* 91.1 (OL = 84.3–98.0, N = 4); *d1*:*d2* 108.3 (OL = 105.8–111.7, N = 4); *d2*:*d3* 111.7 (OL = 101.9–117.6, N = 4); *d3*:*d5* 152.9 (OL = 147.0–162.7, N = 4); *d1*:*d5* 372.9 (OL = 366.5–384.2, N = 4); *l3* 70.6 (N = 2); *l4* 28.8 (OL = 23.5–33.3, N = 3); *pai* 19.1 (OL = 17.6–19.6, N = 4). Legs (femur to tarsus): I, 52.9–54.9, 56.8–58.8, 47.0–49.0, 72.5–74.5; II, 62.7–64.7, 60.8, 52.9–54.9, 88.2–94.1; III, 43.1–45.1, 58.8–60.8, 43.1, 94.1–96.0; IV, 52.9–54.9, 66.6–70.6, 54.9–56.8, 117.6–121.5.

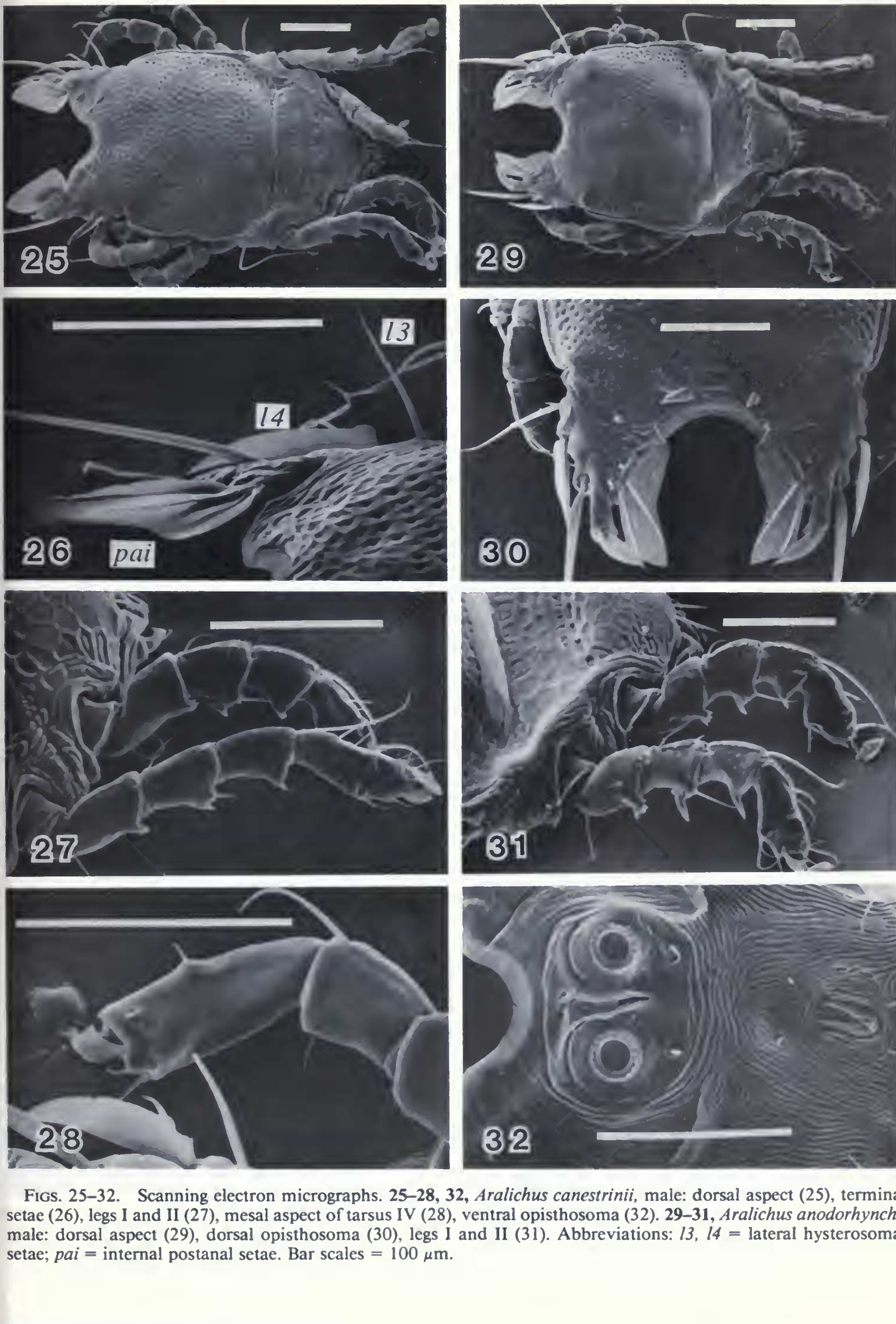
TYPE DATA (ONLY ADULTS AS TYPES)—From *Ara ararauna*: **PANAMA: Darién:** El Real, Río Tuira, holotype ♂, 4 ♂♂, 3 ♀♀, 21 January 1915, W. B. Richardson (AMNH 134,651; YSU 2,767); same data as holotype, 7 ♂♂, 2 TNN, 3 PNN (AMNH 134,650; YSU 2,766). **COLOMBIA:** Río Magdalena, (?Puerto Niño), 2 ♂♂, 1 ♀, January 1913, Chapman, Cherrie et al. (AMNH 121,457; YSU 2,768). Paratypes are deposited in AMNH, GAUD, UGA, UNAM.

DISCUSSION—**Relationships**—Two new species, *A. araraunae* and *A. manilatae,* are intermediate between the species with male setae *pai* triangular and setae *d5* setiform. The males of these two species have truncated setae *pai* with the anterior margins not greatly expanded and setae *d5* straight and setiform or expanded slightly near their bases (compare figs. 21–22 with 23–24).

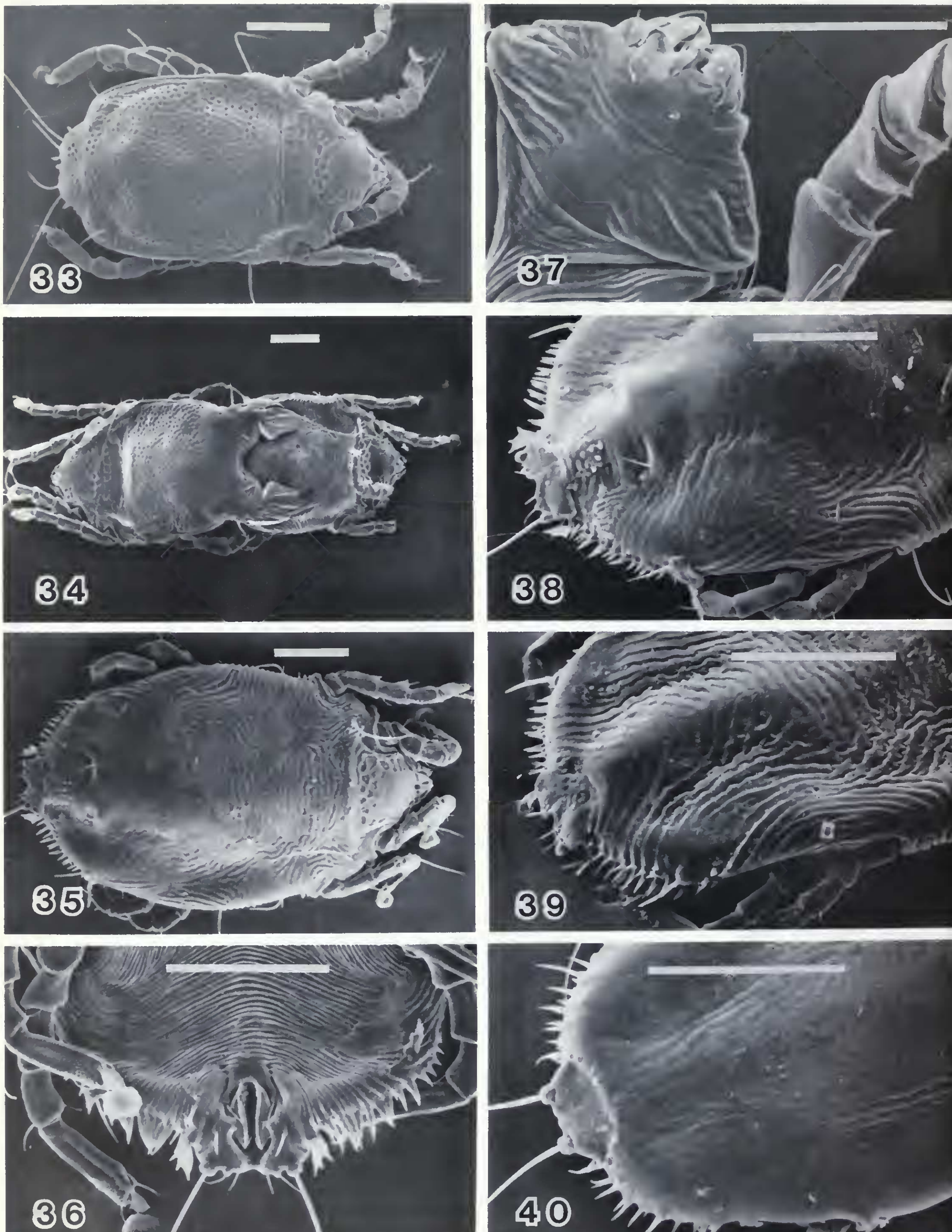
Remarks—The slide bearing the holotype has two males; the holotype is that specimen with two setae *d5*. Females have a few short terminal spines lateral to setae *l4*. Nymphs have weakly developed pygidial areas with the inverted U-shaped striae present almost to the terminus (figs. 41–43), and setae *d5* are about half the lengths of *l5*. Tritonymphs have setae *l4* setiform and uniquely developed setae *pai* in the shape of a nerve cell with long dendrites, the longest of which is about 80 μm; the level of setae *d3* is far posterior to the level of *l3*. Protonymphs have setae *l4* and *pai* small and leaflike and the level of setae *d3* slightly anterior to *l3*.

Aralichus manilatae Atyeo, NEW SPECIES. Figures 16, 22.

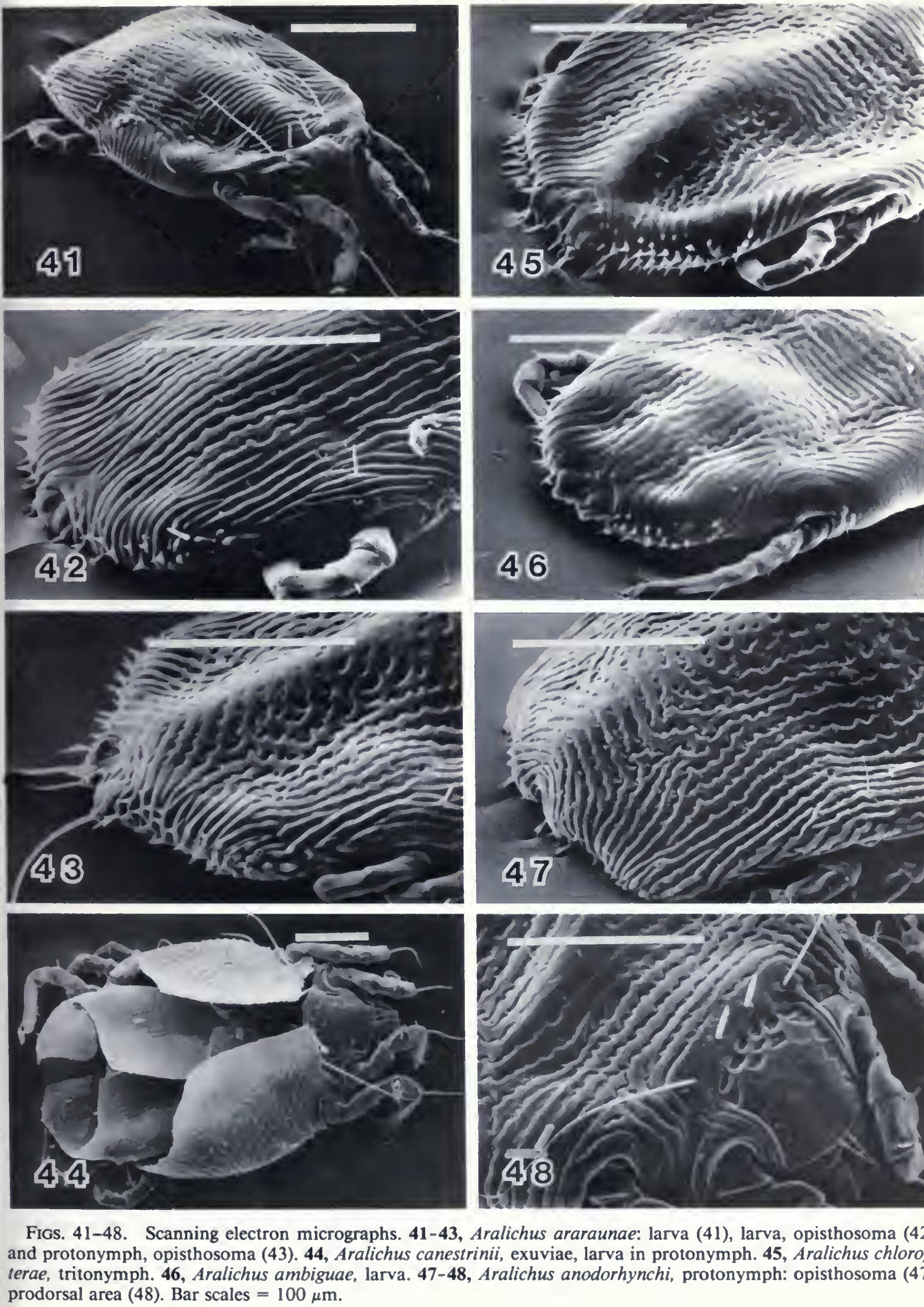
Holotype: Male, deposited at American Museum of Natural History.
Type host: *Ara manilata* (Boddaert).
Type locality: Limontuba, Rio Tapajós, Pará, Brazil.



FIGS. 25–32. Scanning electron micrographs. **25–28, 32,** *Aralichus canestrinii,* male: dorsal aspect (25), terminal setae (26), legs I and II (27), mesal aspect of tarsus IV (28), ventral opisthosoma (32). **29–31,** *Aralichus anodorhynchi,* male: dorsal aspect (29), dorsal opisthosoma (30), legs I and II (31). Abbreviations: *l3, l4* = lateral hysterosomal setae; *pai* = internal postanal setae. Bar scales = 100 μm.



FIGS. 33–40. Scanning electron micrographs of *Aralichus canestrinii*: **33,** female, dorsal aspect; **34,** male and tritonymph; **35,** tritonymph, dorsal aspect; **36,** tritonymph, ventral opisthosoma; **37,** male, ventral gnathosoma; **38,** tritonymph, opisthosoma; **39,** protonymph, opisthosoma; **40,** larva, opisthosoma. Bar scales = 100 μm.



FIGS. 41–48. Scanning electron micrographs. **41-43,** *Aralichus araraunae*: larva (41), larva, opisthosoma (42), and protonymph, opisthosoma (43). **44,** *Aralichus canestrinii,* exuviae, larva in protonymph. **45,** *Aralichus chloropterae,* tritonymph. **46,** *Aralichus ambiguae,* larva. **47-48,** *Aralichus anodorhynchi,* protonymph: opisthosoma (47), prodorsal area (48). Bar scales = 100 μm.

Diagnosis—Male setae *pai* apically quadrate and expanded slightly anterior to base, setae *d5* short and lanceolate, setae *d* on tarsi IV dorsolateral, total length 459–490 μm.

Description—**Male**—Length 477 ± 2.6 (OL = 459–490, N = 18); width 268 ± 2.1 (OL = 239–278, N = 15). Gnathosoma: 78.3 ± 0.4 (OL = 74.5–82.4, N = 18) × 101.4 ± 0.5 (OL = 98.0–105.8, N = 16). Prodorsum: Ornamentation weakly developed; *sce:sce* 97.3 ± 1.0 (OL = 88.2–103.9, N = 18); *sci:sci* 41.0 ± 0.7 (OL = 35.3–45.1, N = 18). Hysterosoma: Setae *pai* truncated, not expanded anterior to insertion; setae *d5* narrowly lanceolate, not S-shaped; measurements: *d1:d1* 58.1 ± 1.1 (OL = 47.0–66.6, N = 18); *d2:d2* 103.2 ± 0.9 (OL = 98.0–113.7, N = 18); *d3:d3* 83.0 ± 0.8 (OL = 75.5–89.2, N = 18); *d5:d5* 142.5 ± 1.6 (OL = 129.4–152.9, N = 18); *l5:l5* 157.7 ± 1.2 (OL = 147.0–168.6, N = 18); *d1:d2* 63.3 ± 0.9 (OL = 56.8–68.6, N = 18); *d2:d3* 142.5 ± 1.1 (OL = 133.3–149.0, N = 18); *d1:d3* 205.9 ± 1.3 (OL = 196.0–213.6, N = 18); *d3:pai* 21.1 ± 0.3 (OL = 19.6–25.4, N = 18); *pai:d5* 36.7 ± 0.4 (OL = 33.3–39.2, N = 18); *l5:d5* 32.0 ± 0.3 (OL = 29.4–33.3, N = 18); *l3* 79.8 ± 1.3 (OL = 66.6–90.2, N = 17); *pai* 76.4 ± 0.6 (OL = 72.5–82.3, N = 18); terminal cleft 72.3 ± 0.6 (OL = 68.6–74.6, N = 10). Legs: Anterior legs with apicoventral apophyses moderately developed (as in fig. 27); setae *d* on tarsi IV inserted dorsolateral (fig. 16); measurements (femur to tarsus): I, 39.2–45.1, 39.2–41.2, 36.1–38.0, 54.9–60.8; II, 45.9–49.0, 40.0–41.2, 39.2–41.2, 66.6–70.6; III, 29.4–33.3, 37.2–43.2, 32.3–35.3, 64.2–66.6; IV, 29.4–33.3, 41.2–43.1, 35.3–37.2, 74.5–77.3.

Female—Length 488 ± 3.9 (OL = 463–517, N = 17); width 273 ± 2.5 (OL = 254–293, N = 16). Proterosoma and legs as in male. Gnathosoma: 83.1 ± 0.4 (OL = 80.4–84.3, N = 16) × 107.1 ± 0.8 (OL = 101.9–113.7, N = 16). Prodorsum: *sce:sce* 98.5 ± 0.9 (OL = 92.1–105.8, N = 17); *sci:sci* 40.7 ± 1.2 (OL = 35.3–49.0, N = 17). Hysterosoma: Setae *l4, pai* leaflike with coarsely serrated margins; *d1:d1* 63.7 ± 0.9 (OL = 58.8–68.6, N = 16); *d2:d2* 113.3 ± 0.8 (OL = 109.8–121.5, N = 17); *d3:d3* 78.3 ± 1.2 (OL = 70.6–90.2, N = 17); *d1:d2* 77.3 ± 0.8 (OL = 70.6–84.3, N = 17); *d2:d3* 99.0 ± 2.1 (OL = 82.3–113.7, N = 17); *d3:d5* 119.9 ± 1.6 (OL = 109.8–129.4, N = 17); *d1:d5* 297.0 ± 2.5 (OL = 278.3–319.5, N = 17); *l3* 39.9 ± 0.6 (OL = 36.3–43.3, N = 16); *l4* 15.4 ± 0.5 (OL = 11.8–19.6, N = 16); *pai* 12.8 ± 0.3 (OL = 9.8–15.7, N = 17). Legs (femur to tarsus): I, 39.2–43.1, 39.2–41.2, 37.2–39.2, 52.9–58.8; II, 46.0–50.9, 39.2–41.2, 39.2–41.2, 62.7–68.6; III, 29.4–33.3, 37.2–41.2, 33.3–35.3, 68.6–72.5; IV, 32.3–35.3, 45.1–47.0, 40.0–42.1, 82.0–86.2

Type Data (only adults as types)—From *Ara manilata*: **BRAZIL: Pará**: Rio Tapajós, Limontuba, holotype ♂, 10 ♂♂, 10 ♀♀, 8 August 1931, A. M. Olalla (AMNH 288,214; UGA 10,350); S. Santarém, 1 ♂, 3 ♀♀, 7 TNN, 5 PNN, 21 July 1931, A. M. Olalla (AMNH 288,213; UGA 10,351); Rio Tapajós, Santarém, 3 ♂♂, 1 ♀, 15 August 1959, A. M. Olalla (FMNH 257,850; UGA 11,549–50); Vilarinho, 2 ♂♂, 1 ♀, 26 September 1931, A. M. Olalla (AMNH 429,109; UGA 10,352). **PERU: Loreto**: Río Ucayali, Yarina-Cocha, 1 ♂, 2 ♀♀, 4 TNN, 2 PNN, 2 LL, 16 May 1946, J. M. Schunke (FMNH 185,553; UGA 11,546). Paratypes are deposited in AMNH, BMNH, FMNH, NMNH, GAUD, UGA, UNAM.

Discussion—**Relationships**—In addition to the general size differences between *Aralichus manilatae* and the related *A. araraunae*, n. sp., other structures exhibit marked differences in size. In comparing males of *manilatae* with those of *araraunae,* setae *pai* are 76 μm (OL = 72–82) versus 101 μm (OL = 96–106), setae *l3* are 80 μm (OL = 67–90) versus 105 μm (OL = 94–114), and the external scapular setae are separated by 97 μm (OL = 88–104) versus 118 μm (OL = 108–127).

Remarks—The tritonymphs of only two species, the one being described and *Aralichus araraunae,* have the levels of setae *d3* far posterior to the level of setae *l3.* The tritonymphs of *A. manilatae* have weakly developed spines on the idiosomal terminus, while the protonymphs have well-developed spines.

Aralichus couloni Atyeo, NEW SPECIES. Figures 17, 20.

Holotype: Male, deposited at Field Museum of Natural History.
Type host: *Ara couloni* Sclater.
Type locality: Fundo Cinchona, Ucayali, Peru.

Diagnosis—Male setae *pai* truncated and expanded slightly anterior of setal base, setae *d5* expanded basally into an almost symmetrical S, total length 424–443 μm.

Description—**Male**—Length 433 ± 1.5 (OL = 424–443, N = 14); width 246 ± 1.2 (OL = 239–254, N = 14). Gnathosoma: 70.5 ± 0.3 (OL = 68.6–72.5, N = 14) × 96.7 ± 0.6 (OL = 94.1–100.0, N = 14). Prodorsum: Ornamentation weakly developed or absent; *sce:sce* 91.8 ± 0.7 (OL = 88.2–96.0, N = 14); *sci:sci* 33.6 ± 1.0 (OL = 27.4–39.2, N = 14). Hysterosoma: Setae *pai* truncated, expanded slightly anterior of insertion; setae *d5* S-shaped with basal expansion 41 × 12; measurements: *d1:d1* 39.8 ± 1.3 (OL = 34.4–47.0, N = 13); *d2:d2* 105.8 ± 1.5 (OL = 96.0–115.6, N = 14); *d3:d3* 86.5 ± 1.0 (OL = 82.3–94.1, N = 14); *d5:d5* 130.6 ± 0.5 (OL = 121.5–139.2, N = 14); *l5:l5* 149.0 ± 1.1 (OL = 141.1–154.8, N = 14); *d1:d2* 47.5 ± 0.6 (OL = 43.1–50.9, N = 13); *d2:d3* 133.3 ± 0.7 (OL = 129.4–137.2, N = 14); *d1:d3* 180.6 ± 0.9 (OL = 178.4–186.2, N = 13); *d3:pai* 24.8 ± 0.2 (OL = 23.5–25.4, N = 14); *pai:d5* 32.4 ± 0.4 (OL = 29.4–39.3, N = 14); *l5:d5* 31.8 ± 0.3 (OL = 30.4–33.3, N = 14); *l3* 54.1 ± 0.9 (OL = 47.0–60.8, N = 12); *pai* 68.3 ± 0.5 (OL = 64.7–70.6, N = 14); terminal cleft 60.7 ± 0.5 (OL = 58.8–62.7, N = 12). Legs: Anterior legs with apicoventral apophyses moderately developed (as in fig. 27); setae *d* on tarsi IV inserted dorsolateral (fig. 17); measurements (femur to tarsus): I, 39.2–41.2, 37.2–39.2, 31.4–33.3, 49.0–50.9; II, 41.2–45.1, 36.1–39.2, 33.3–35.3, 58.8–64.7; III, 27.4–39.5, 38.0–41.2, 29.4–31.4, 62.7–64.7; IV, 29.4–31.4, 42.0–45.1, 31.4–33.3, 64.7–66.6.

Female—Length 475 (OL = 470–482, N = 5); width 261 (OL = 254–270, N = 5). Proterosoma and legs as in male. Gnathosoma: 79.2 (78.4–80.4, N = 5) × 101.9 (OL = 98.0–103.9, N = 5). Prodorsum: *sce:sce* 95.3 (OL = 92.1–98.0, N = 5); *sci:sci* 38.0 (OL = 35.3–46.1, N = 5). Hysterosoma: Setae *l4, pai* leaflike with coarsely serrated margins; *d1:d1* 49.5 (OL = 41.2–56.8, N = 4); *d2:d2* 112.5 (OL = 107.8–117.6, N = 5); *d3:d3* 88.6 (OL = 80.4–90.2, N = 5); *d1:d2* 59.2 (OL = 54.9–66.6, N = 5); *d2:d3* 81.9 (OL = 74.5–90.2, N = 5); *d3:d5* 138.9 (OL = 129.4–150.9, N = 5); *d1:d5* 229.7 (OL = 217.6–237.2, N = 5); *l3* 36.3 (OL = 33.3–39.3, N = 4); *l4* 15.3 (OL = 13.7–17.6, N = 5); *pai* 13.7 (N = 5). Legs (femur to tarsus): I, 39.2–43.1, 36.1–39.2, 31.4–33.3, 54.9–58.8; II, 45.1–49.0, 35.3–37.2, 35.3–39.2, 60.8–64.7; III, 29.4–33.3, 39.2–43.1, 31.4–33.3, 64.7–66.6; IV, 31.4–35.3, 47.0–50.9, 35.3–37.2, 82.3–84.3.

TYPE DATA (ONLY ADULTS AS TYPES)—From *Ara couloni*: **PERU: Ucayali:** Fundo Cinchona (= Huánuco, Finca or Fundo Sinchona), holotype ♂, 6 ♂♂, 2 ♀♀, 5 TNN, 3 PNN, 2 LL, 10 August 1947, J. M. Schunke (FMNH 187,759; UGA 11,567); same data as holotype, 4 ♂♂, 1 ♀ (FMNH 187,758; UGA 11,565); Fundo Cinchona (= Huánuco), Chinchavito, 2 ♂♂, 1 ♀, 7 March 1974, P. Hooking, M. Villar (FMNH 299,018; UGA 11,563); Luisiana, Río Apurímac, 1 ♂, 1 ♀, 17 July 1963, C. B. Koford (AMNH 781,783; UGA 10,358). Paratypes deposited in AMNH, FMNH, GAUD, UGA, UNAM.

DISCUSSION—**Relationships**—Males of two new species, *Aralichus couloni* and *A. severae*, have almost symmetrical, S-shaped setae *d5*, and truncated setae *pai* that are expanded slightly anterior to their insertions. These species can be distinguished from each other by the sizes of many structures: for example, *A. couloni* has setae *l3* 54 μm (OL = 47–61) and the inflated portion of setae *d5* about 41 × 12 μm; these structures in *A. severae* are 80 μm (OL = 73–90) and 49 × 14 μm.

Remarks—The proto- and tritonymphs of *Aralichus couloni* and *A. severae* have setae *d3* positioned approximately midway between the levels of the opisthonotal gland and setae *l3*; small, blunt spines on the terminus; poorly developed pygidial regions; and smooth striae on the dorsum. These are the only tritonymphs with setae *d3* so positioned, yet other protonymphs share this character-state, namely, *A. nobilis*, *A. severae*, and *A. manilatae*. *Aralichus nobilis* immatures also have smooth, dorsal striations. The prodorsal ornamentation can be weakly developed or apparently absent.

The hosts of *Aralichus militaris* and *A. couloni* are sympatric in parts of their ranges. Both of the mite species have been collected from skins taken at Fundo Cinchona; however, the collections were made in different years.

Aralichus severae Atyeo, NEW SPECIES.

> Holotype: Male, deposited at Field Museum of Natural History.
> Type host: *Ara severa castaneifrons* Lafresnaye.
> Type locality: Putumayo, San Antonio, Colombia.

DIAGNOSIS—Male setae *pai* truncated at slight angle and expanded slightly anterior to setal base, setae *d5* S-shaped (similar to fig. 20), total length 459–486 μm.

DESCRIPTION—**Male**—Length 471 ± 2.9 (OL = 459–486, N = 11); width 272 ± 1.9 (OL = 266–282, N = 11). Gnathosoma: 78.5 ± 0.5 (OL = 76.4–82.3, N = 11) × 102.1 ± 0.8 (OL = 98.0–107.8, N = 11). Prodorsum: Ornamentation well developed; *sce:sce* 96.8 ± 1.1 (OL = 82.2–109.9, N = 11); *sci:sci* 33.4 ± 1.2 (OL = 27.4–41.2, N = 11).

Hysterosoma: Setae *pai* truncated, expanded slightly anterior to insertion; setae *d5* S-shaped, basal expansion about 49 × 14; measurements: *d1:d1* 61.6 ± 1.3 (OL = 54.9–70.6, N = 11); *d2:d2* 114.6 ± 1.1 (OL = 109.8–121.5, N = 11); *d3:d3* 97.7 ± 0.2 (OL = 90.2–100.0, N = 11); *d5:d5* 139.5 ± 0.5 (OL = 131.1–154.2, N = 11); *l5:l5* 162.6 ± 0.5 (OL = 154.2–181.3, N = 11); *d1:d2* 58.4 ± 0.8 (OL = 52.9–62.7, N = 11); *d2:d3* 140.8 ± 1.2 (OL = 135.2–147.0, N = 11); *d1:d3* 200.5 ± 1.7 (OL = 192.1–209.7, N = 11); *d3:pai* 28.0 ± 0.6 (OL = 25.5–31.4, N = 11); *pai:d5* 35.6 ± 0.5 (OL = 33.3–37.2, N = 11); *l5:d5* 33.5 ± 0.5 (OL = 29.4–35.3, N = 11); *l3* 80.2 ± 1.6 (OL = 72.5–90.2, N = 11); *pai* 72.7 ± 0.7 (OL = 68.6–78.4, N = 11); terminal cleft 74.0 ± 0.5 (OL = 72.5–76.4, N = 8). Legs: Anterior legs with apicoventral apophyses moderately developed (as in fig. 27); setae *d* on tarsi IV inserted dorsolateral (as in fig. 15); measurements (femur to tarsus): I, 41.2–43.1, 41.2, 33.3–35.3, 56.8–58.8; II, 47.0–50.9, 42.0–43.1, 37.2–39.2, 70.6–72.5; III, 33.3–35.3, 41.2–47.0, 31.4–33.3, 62.7–68.6; IV, 33.3–35.3, 47.0–49.0, 35.3–37.2, 66.6–72.5.

Female—Length 498 (OL = 486–504, N = 4); width 282 (OL = 278–289, N = 4). Proterosoma and legs as in male. Gnathosoma: 83.3 (OL = 82.3–84.3, N = 4) × 109.8 (OL = 103.9–115.6, N = 4). Prodorsum: *sce:sce* 96.0 (OL = 92.1–100.0, N = 4); *sci:sci* 31.4 (OL = 25.4–36.3, N = 4). Hysterosoma: Setae *l4*, *pai* leaflike with coarsely serrated margins; *d1:d1* 73.0 (OL = 64.7–78.4, N = 4); *d2:d2* 125.1 (OL = 119.6–131.3, N = 3); *d3:d3* 90.7 (OL = 86.2–96.0, N = 4); *d1:d2* 66.2 (OL = 64.7–68.6, N = 4); *d2:d3* 95.6 (OL = 92.1–98.0, N = 4); *d3:d5* 146.5 (OL = 143.1–149.0, N = 4); *d1:d5* 308.2 (OL = 303.8–313.6, N = 4); *l3* 50.9 (N = 4); *l4* 21.6 (OL = 19.6–23.5, N = 4); *pai* 13.2 (OL = 11.8–13.7, N = 4). Legs (femur to tarsus): I, 41.2–45.1, 41.2–43.5, 35.3–37.2, 60.8–62.7; II, 50.9–52.9, 41.2–43.1, 35.3–37.2, 72.5–74.5; III, 31.4, 45.1–47.0, 33.3–35.3, 66.6–68.6; IV, 39.2–41.2, 52.9–56.8, 41.2–43.1, 88.2–92.1.

TYPE DATA (ONLY ADULTS AS TYPES)—From *Ara severa castaneifrons*: **COLOMBIA: Putumayo:** San Antonio, holotype ♂, 9 ♂♂, 4 ♀♀, 3 TNN, 2 PNN, 2 LL, 2 PNN and 1 L cast skin, 6 November 1969, K. von Sneidern (FMNH 286,761; UGA 11,542). **BRAZIL: Pará:** Rio Tapajós, Tapaiuna, 1 ♂, 12 August 1959, A. M. Olalla (FMNH 257,874; UGA 11,533). Paratypes are deposited in FMNH, UGA, UNAM.

DISCUSSION—**Relationships**—This species is larger than the related *Aralichus couloni*. For characters to distinguish them, see the previous description.

Aralichus nobilis Atyeo, NEW SPECIES. Figures 18, 23.

Holotype: Male, deposited at Field Museum of Natural History.
Type host: *Ara nobilis cumanensis* (Lichtenstein).
Type locality: Turiaçu, Maranhão, Brazil.

DIAGNOSIS—Male setae *pai* truncated at approximately 45° angle, extending about ⅓ length beyond lobe apices, anteromesal expansions almost meeting at meson; setae *d5* S-shaped (fig. 23); distance *d1:d1* equal to or greater than distance *d2:d2*.

Note—For males there are two size classes; if measurements are significantly different for a morphometric character, each measurement will give the average and observed limits for the complete series, followed in brackets by the appropriate statistics for the smaller size class and then the larger size class.

DESCRIPTION—**Male**—Length 405 ± 3.1 (OL = 378–432, N = 29) [393 ± 2.0 (OL = 378–409, N = 17; 422 ± 1.9 (OL = 409–432, N = 12)]; width 238 ± 1.9 (OL = 216–258, N = 29) [232 ± 1.6 (OL = 216–251, N = 12); 246 ± 2.2 (OL = 239–258, N = 12)]. Gnathosoma: 67.5 ± 0.5 (OL = 62.7–74.5, N = 29) [65.7 ± 0.4 (OL = 64.7–68.6, N = 17); 70.1 ± 0.7 (OL = 66.6–74.5, N = 12)] × 87.6 ± 0.7 (OL = 80.4–98.0, N = 29). Prodorsum: Ornamentation absent; *sce:sce* 82.6 ± 0.7 (OL = 74.5–88.2, N = 29); *sci:sci* 27.3 ± 0.4 (OL = 23.5–31.4, N = 29). Hysterosoma: Setae *pai* truncated, expanded anterior to insertion; setae *d5* expanded basally to form asymmetrical S; measurements: *d1:d1* 90.8 ± 1.8 (OL = 72.5–115.6, N = 27) [84.3 ± 1.5 (OL = 72.5–95.1, N = 16); 100.2 ± 2.9 (OL = 84.3–115.6, N = 11)]; *d2:d2* 80.9 ± 1.5 (OL = 68.6–103.9, N = 28); *d3:d3* 75.2 ± 0.6 (OL = 70.6–80.4, N = 29); *d5:d5* 115.3 ± 1.4 (OL = 105.8–133.3, N = 29) [110.7 ± 0.8 (OL = 105.8–117.6, N = 17); 121.9 ± 1.7 (OL = 113.7–133.3, N = 12)]; *l5:l5* 132.0 ± 1.3 (OL = 121.5–147.0, N = 29) [127.2 ± 0.7 (OL = 121.5–132.3, N = 17); 138.7 ± 1.5 (OL = 133.3–147.0, N = 12)]; *d1:d2* 53.3 ± 2.0 (OL = 43.1–72.5, N = 28); *d2:d3* 130.5 ± 1.6 (OL = 115.6–147.0, N = 29) [124.2 ± 1.2 (OL = 115.6–133.3, N = 17); 139.3 ± 0.9 (OL = 133.3—145.0, N = 12)]; *d1:d3* 184.8 ± 2.5 (OL = 166.6–207.8, N = 29) [174.3 ± 1.6 (OL = 166.6–186.2, N = 16); 197.3

± 1.5 (OL = 190.1–207.8, N = 12)]; *d3:pai* 21.8 ± 0.4 (OL = 18.6–25.4, N = 29); *pai:d5* 24.0 ± 0.3 (OL = 19.6–27.4, N = 29); *l5:d5* 28.3 ± 0.4 (OL = 25.4–32.4, N = 29); *l3* 71.3 ± 0.8 (OL = 62.7–76.4, N = 26); *pai* 104.6 ± 0.7 (OL = 98.0–111.7, N = 27); terminal cleft 53.4 ± 0.6 (OL = 50.0–58.8, N = 29) [51.5 ± 0.4 (OL = 51.0–54.9, N = 17); 56.1 ± 0.7 (OL = 52.9–58.8, N = 12)]. Legs: Anterior legs with apicoventral apophyses moderately developed (as in fig. 27); setae *d* on tarsi IV inserted dorsolateral (fig. 18); measurements (femur to tarsus): I, 33.3–39.2 (33.2–33.6, 37.2–39.2), 29.4–35.3 (29.4–31.4, 33.3–35.3), 27.4–31.4 (27.4–29.4, 29.4–31.4), 45.1–50.9 (45.1–49.0, 49.0–50.9); II, 37.2–45.1 (37.2–43.1, 41.2–45.1), 29.4–33.3 (29.4–31.4, 33.3), 27.4–33.3 (27.4–29.4, 31.4–33.3), 49.0–58.8 (49.0–54.9, 58.8); III, 19.6–25.4 (19.6–22.5, 24.4–25.4), 31.4–35.3 (31.4–33.3, 33.3–35.3), 25.4–31.4 (25.4–29.4, 29.4–31.4), 52.9–60.8 (52.9–56.8, 60.8); IV, 21.6–27.4 (21.6–23.5, 27.4), 31.4–39.2 (31.4–35.3, 35.3–39.2), 29.4–35.3 (29.4–31.4, 31.4–35.3), 54.9–68.6 (54.9–58.8, 64.7–68.6).

Female—Length 452 ± 3.7 (OL = 424–474, N = 14); width 246 ± 2.2 (OL = 228–258, N = 14). Proterosoma and legs as in male. Gnathosoma: 75.4 ± 0.6 (OL = 72.5–78.4, N = 14) × 93.0 ± 1.3 (OL = 84.3–101.9, N = 14). Prodorsum: *sce:sce* 88.8 ± 1.0 (OL = 82.3–94.1, N = 13); *sci:sci* 28.7 ± 0.8 (OL = 23.5–32.4, N = 13). Hysterosoma: Setae *l4, pai* leaflike with coarsely serrated margins; *d1*: *d1* 86.1 ± 2.0 (OL = 74.5–96.0, N = 12); *d2:d2* 83.5 ± 1.4 (OL = 76.4–90.2, N = 13); *d3:d3* 62.9 ± 1.6 (OL = 54.9–72.5, N = 13); *d1:d2* 59.3 ± 1.4 (OL = 50.9–68.6, N = 13); *d2:d3* 97.0 ± 1.6 (OL = 88.2–107.8, N = 13); *d3:d5* 116.7 ± 2.1 (OL = 103.9–131.3, N = 13); *d1:d5* 273.0 ± 2.3 (OL = 256.0–284.2, N = 13); *l3* 33.5 ± 1.7 (OL = 27.4–45.1, N = 12); *l4* 10.7 ± 0.3 (OL = 9.8–11.8, N = 11); *pai* 10.4 ± 0.4 (OL = 9.8–13.7, N = 12). Legs (femur to tarsus): I, 35.3–39.2, 31.4–33.3, 27.4–29.4, 47.0–52.9; II, 39.2–45.1, 29.4–31.4, 29.4–31.4, 54.9–58.8; III, 19.6–25.4, 30.3–31.4, 27.4–30.3, 50.9–62.7; IV, 23.5–29.4, 33.3–37.2, 33.3–34.2, 68.6–76.4.

TYPE DATA (ONLY ADULTS AS TYPES)—From *Ara nobilis cumanensis* (Lichtenstein): **BRAZIL: Maranhão:** Turiaçu, holotype ♂, 10 ♂♂, 5 ♀♀, 3 TNN, 5 PNN, 27 November 1923, H. Snethlage (FMNH 62,875; UGA 11,583). From *Ara n. nobilis* (L.): **VENEZUELA: Bolívar:** Mt. Roraima, 2 ♂♂, 3 ♀♀, 2 TNN, 3 December 1927, T. D. Carter (AMNH 236,519; UGA 10,359) and 2 ♂♂, 3 ♀♀, 31 October 1927 (2 collections, AMNH 236,520–1; UGA 10,360–1); **BRAZIL: Amazonas:** Serra de Lua, near Boa Vista, 1 ♂, 16 February 1913, Becker and Anderson (FMNH 45,047; UGA 11,577); **Espirito Santo:** Lagôa Juparaná, 1 ♀, 23 November 1929, E. Kaempfer (AMNH 317,267; UGA 11,589). Paratypes are deposited in AMNH, BMNH, FMNH, GAUD, LAS, TRT, UGA, UNAM.

ADDITIONAL MATERIAL—From *Ara nobilis cumanensis*: **BRAZIL: Maranhão:** Rosario, 6 ♂♂, 1 ♀, 1 PN, 1 L, 16 May 1924, H. Snethlage (FMNH 62,878; UGA 11,580). From *Ara nobilis longipennis* (Neumann): **BRAZIL: Goiás:** Filadélfia, 6 ♂♂, 30 November 1925, H. Snethlage (FMNH 62,880; UGA 11,588).

DISCUSSION—**Relationships**—Two new species have males with setae *pai* expanded approximately one-third their lengths anterior to their insertions, *Aralichus nobilis* and *A. anodorhynchi. Aralichus nobilis* has glabrous dorsal shields, or the hysterosomal shield may have small, shallow pits, and setae *d5* shaped in an asymmetrical S; *A. anodorhynchi* has ornamented dorsal shields and setae *d5* symmetrical and basally expanded. The species being described is most closely related to a complex of new species found on *Aratinga* species; this complex in turn is related to *A. microphyllus* (Mégnin & Trouessart) and *A. inermis* (Mégnin & Trouessart) from *Pionites* species. Of the species being described, the females of *A. nobilis* are the only ones with setae *l4* setiform and the males with setae *d* and *e* of tarsi IV approximate (fig. 18).

There are two size classes of males with only one size class in each collection. Females range from small to large in some of the collections; therefore, size classes cannot be correlated with the males. If the small and large males were associated with a particular subspecies or in a distinct geographical range, it would be easy to consider each as a distinct species. However, there are four collections of the small form from *Ara n. nobilis,* the subspecies occupying the western range of the host species, and a single collection of the large form from *A. n. longipennis* from northern Goiás, Brazil. A problem exists because both forms have been collected from *A. n. cumanensis* along the northern coast of Maranhão, Brazil—two collections of the smaller males from Turiaçu and one collection of the larger males from Rosario. Because of the possibility that they are two species, the smaller form is selected to represent the name *Aralichus nobilis.*

Remarks—The terminal regions of all immature stages of *Aralichus nobilis* are different from other species described in this paper. There is no well-developed pygidial region, but there are two sclerotized extensions of the idiosoma extending between the posterior setae, much in appearance of anal valves. Setae *pai* in the nymphal stadia are thin microsetae positioned dorsal to setae *d5*. Larvae lack spines in the posterior idiosomal margin, whereas the nymphs have small, weakly developed spines. The nymphs also have setae *d5* one-quarter to one-third the length of setae *l5*. Finally, the immatures of this species have straight striae, rather than irregular striae.

Aralichus maracanae Atyeo, NEW SPECIES.

Holotype: Male, deposited at British Museum (Natural History).
Type host: *Ara maracana* (Vieillot).
Type locality: Brazil.

DIAGNOSIS—Male setae *pai* truncated and extending only slightly anterior to bases; *d5* expanded, asymmetrical; expanded portion about 31 × 18 μm, setae *pai* truncated posteriorly; length 455–463 μm.

DESCRIPTION—**Male**—Length 459 (OL = 455–463, N = 2); width 135.2 (N = 2). Gnathosoma: 74.5 (N = 2) × 98.0 (N = 2). Prodorsum: Ornamentation well developed (???); *sce:sce* 88.7 (OL = 88.2–89.2, N = 2); *sci:sci* 36.6 (OL = 36.3–37.2, N = 2). Hysterosoma: Setae *pai* truncated, expanded anterior to insertion; setae *d5* expanded basally, S-shaped, expanded portion about 17.6 × 31.4; measurements: *d1:d1* 45.1 (OL = 43.1–47.0, N = 2); *d2:d2* 106.8 (OL = 105.8–107.8, N = 2); *d3:d3* 83.3 (OL = 78.4–88.2, N = 2); *d5:d5* 127.4 (N = 2); *l5:l5* 147.0 (N = 2); *d1:d2* 53.9 (OL = 52.9–54.9, N = 2); *d2:d3* 137.2 (N = 2); *d1:d3* 191.1 (OL = 190.1–192.2, N = 2); *d3:pai* 27.4 (OL = 25.4–29.4, N = 2); *pai:d5* 40.2 (OL = 37.2–43.1, N = 2); *l5:d5* 36.3 (OL = 33.3–39.2, N = 2); *l3* 54.9 (N = 2); *pai* 70.6 (OL = 68.6–72.5, N = 2); terminal cleft 64.7 (N = 1). Legs: Anterior legs with apicoventral apophyses moderately developed (as in fig. 27); setae *d* on tarsi IV inserted dorsolaterally (fig. 15); measurements (femur to tarsus): I, 39.2–41.2, 37.3–41.2, 31.4, 52.9–55.8; II, 45.1–47.0, 37.2–39.2, 37.2, 54.7; III, 31.4–32.3, 41.2–42.1, 32.3–33.3, 66.6–68.6; IV, 31.4–33.3, 46.0–47.0, 33.3–35.3, 69.5–70.6.

Female—Unknown.

TYPE DATA—From *Ara maracana*: **BRAZIL**: no other data, holotype ♂, 1 ♂ paratype (BMNH 49.4.26.1; UGA 12,835). The paratype is deposited in UGA.

DISCUSSION—**Relationships**—Although only two males are known, the modifications of setae *d5* are distinct and signify a close affinity to *Aralichus nobilis*.

Remarks—The accession number of the British Museum (Natural History) indicates that the bird skin was received by the museum in 1849; when the parrot was actually collected is unknown. I collected the mite specimens in the summer of 1987, the time when this manuscript was being revised.

Aralichus anodorhynchi Atyeo, NEW SPECIES. Figures 19, 24, 29–31, 47–48.

Holotype: Male, deposited at British Museum (Natural History).
Type host: *Anodorhynchus hyacinthinus* (Latham).
Type locality: Rio Tapajós, Pará, Brazil.

DIAGNOSIS—Male setae *pai* truncated and expanded about ¼ total length anterior to setal base, anteromesal expansions widely distant; setae *d5* expanded basally, but not S-shaped (fig. 24); length over 600 μm.

DESCRIPTION—**Male**—Length 621 ± 1.4 (OL = 609–636, N = 23); width 387 + 1.5 (OL = 370–401, N = 23). Gnathosoma: 100.8 ± 0.3 (OL = 98.0–101.9, N = 23) × 136.2 ± 0.7 (OL = 131.3–143.1, N = 23). Prodorsum: Ornamentation well developed; *sce:sce* 136.1 ± 0.8 (OL = 129.4–145.0, N = 23); *sci:sci* 50.6 ± 1.5 (OL = 43.1–72.5, N = 23). Hysterosoma: Setae *pai* truncated, expanded anterior to insertion; setae *d5* expanded basally, not S-shaped; measurements: *d1:d1* 74.0 ± 1.1 (OL = 66.6–84.3, N = 23); *d2:d2* 157.4 ± 1.4 (OL = 143.1–170.5, N = 23); *d3:d3* 106.4 ± 1.0 (OL = 94.1–113.7, N = 23); *d5:d5* 207.7 ± 0.9 (OL = 189.0–246.7, N = 15); *l5:l5* 239.2 ± 1.1 (OL = 231.3–246.7, N = 23); *d1:d2* 88.1 ± 1.2 (OL = 78.4–98.0, N = 23); *d2:d3* 184.8 ± 1.0 (OL = 176.4–194.0, N = 23); *d1:d3* 271.2 ± 1.3 (OL = 258.7–280.3, N = 23); *d3:pai* 43.4 ± 0.6 (OL = 39.2–47.0, N = 23); *pai:d5* 47.2 ± 0.5 (OL = 43.1–50.9, N = 23); *l5:d5* 42.7 ± 0.3 (OL = 39.2–45.1, N = 23); *l3* 132.4 ± 2.5 (OL = 117.6–147.0, N = 13); *pai* 105.2 ± 0.5 (OL = 100.0–109.8, N = 22); terminal cleft 111.9 ± 0.9 (OL = 107.9–115.7, N = 19). Legs: Anterior legs with apicoventral apophyses moderately developed (as in fig. 27); setae *d* on tarsi IV inserted dorsolaterally (fig. 19); measurements (femur to tarsus): I, 49.0–50.9, 42.9–54.9, 45.1–49.0, 66.6–76.4; II, 50.9–54.9, 52.9–54.9, 49.0–52.9, 82.3–88.2; III, 37.2–39.2, 50.9–54.9, 43.1–45.1, 84.3–86.2; IV, 35.3–41.2, 54.9–56.8, 45.1–49.0, 88.2–94.1.

Female—Length 647 ± 2.3 (OL = 632–655, N = 10); width 389 ± 2.8 (OL = 370–405, N = 11). Proterosoma and legs as in male. Gnathosoma: 108.2 ± 0.7 (OL = 103.9–113.7, N = 10) × 139.4 ± 1.5 (OL = 131.3–147.0, N = 10). Prodorsum: *sce*: *sce* 135.0 ± 1.5 (OL = 129.4–143.1, N = 9); *sci*: *sci* 48.7 ± 1.6 (OL = 45.1–60.8, N = 9). Hysterosoma: Setae *l4*, *pai* leaflike with coarsely serrated margins; *d1*:*d1* 73.3 ± 2.0 (OL = 62.7–82.3, N = 10); *d2*:*d2* 156.2 ± 2.9 (OL = 137.2–168.6, N = 9); *d3*:*d3* 118.9 ± 2.2 (OL = 105.8–127.4, N = 11); *d1*:*d2* 103.2 ± 1.0 (OL = 98.0–107.8, N = 9); *d2*:*d3* 133.3 ± 2.6 (OL = 123.5–149.0, N = 9); *d3*:*d5* 159.4 ± 2.1 (OL = 150.9–170.5, N = 9); *d1*:*d5* 395.7 ± 2.5 (OL = 388.1–407.7, N = 9); *l3* 42.3 ± 1.2 (OL = 35.3–47.0, N = 10); *l4* 21.6 ± 1.0 (OL = 15.7–27.4, N = 10); *pai* 15.7 ± 0.7 (OL = 13.7–19.6, N = 9). Legs (femur to tarsus): I, 49.0–52.9, 50.9–54.9, 47.0–50.9, 74.5–80.4; II, 54.9–58.8, 49.0–54.9, 50.9–54.9, 90.2–94.1; III, 39.2–47.0, 56.8–62.7, 45.1–50.9, 88.2–101.9; IV, 49.0–54.9, 62.7–74.5, 52.9–58.8, 109.8–119.6.

TYPE DATA (ONLY ADULTS AS TYPES)—From *Anodorhynchus hyacinthinus*: **BRAZIL: Pará:** Rio Tapajós, holotype ♂, 2 ♀♀, 4 TNN, 9 PNN, 4 LL, and exuviae of 1 TN, 1 PN, 2 LL, circa 1850, collector unknown (BMNH 1853.5.13.2; UGA 12,044); Rio Tapajós, 5 ♂♂, 4 ♀♀, April 1931, A. M. Olalla (AMNH 285,807; YSU 2,763); **Minas Gerais:** Diamantina, 3 ♂♂, 1 ♀, 4 TNN, 2 LL, June 1887, C. B. Riker (NMNH 121,050; UGA 12,227); 25 mi in from Diamantina, 5 ♂♂, 1 ♀, 2 TNN, 10 June 1887, C. B. Riker (NMNH 121,049; UGA 12,226); **Mato Grosso:** Rio Taquari, (?Palmeiras), 2 ♂♂, 20 March 1913, L. E. Miller (BMNH 1924.1.24.26; UGA 12,043); Amazonas, 5 ♂♂, 1 ♀, July 1879, H. Whitely (BMNH 1889.1.30.1; UGA 12,042). Paratypes are deposited in AMNH, BMNH, FMNH, GAUD, LAS, NMNH, UGA, UNAM.

DISCUSSION—**Relationships**—The males of these large mites have the apicoventral apophyses extended as long spines on the femora, genua, and tibiae of legs I and II. Those of the males are very long (fig. 31), while those of the females are approximately midlength between *A. canestrinii* (fig. 27) and their own males. Dorsal shields are ornamented as in *canestrinii*, and the male setae *pai* are truncated and extend anteriorly well beyond their insertions.

Remarks—The slide containing the holotype has two specimens; one is incomplete and is not considered as being in the type series. The trito- and protonymphs have setae *d5* three-quarters of the length of *l5*, a condition similar to that in females of all species. The nymphs lack pygidial regions and have few to zero poorly developed posterior spines.

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This study is part of a long-term project on the systematics of feather mites, and during the years many curators have kindly permitted me to collect ectoparasites from ornithological study skins. However, the investigations have taken so long that curators have "come and gone." Therefore, I would like to recognize institutions where I have collected most of the parrot mites, namely, American Museum of Natural History, British Museum (Natural History), Field Museum of Natural History, and the United States National Museum of Natural History.

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